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Central feature of gas industry's exhibit at the 1934 Century of Progress Exposition, at Chicago, now being visited daily by thousands of people. This will be found on the south wall of Gas Industry Hall.

AMERICAN GAS
ASSOCIATION
MONTHLY

Allyn B. Tunis, Editor

Gas Exhibit in New Setting At World's Fair

THE exhibit of the gas industry at the 1934 World's Fair, Chicago, which is sponsored by the American Gas Association, with member gas companies and appliance manufacturers cooperating, occupies large space in an ideal location. It is in the south wing of Home Planning Hall, on Leif Eriksen Drive, at Twenty-eighth Street, just north of the already famous Ford Building. It is in the heart of the popular colony of model homes and next door to the Haeger Potteries exhibit.

Visitors enter the northeast corner of Gas Industry Hall and receive a friendly welcome in a cheerful room where gay colors predominate. A delightful aroma of baking fills the air and the smiling lady attendant invites you to "have a cookie." While you munch the cookie, you find the first of the exhibit's modern appliances, a gas range and a gas-operated refrigerator.

Passing south, along the east wall, the visitor finds a chromatic color scheme for a glorified setting of the world's finest cooking equipment—the modern gas range, with automatic controls, insulated ovens and all the other gadgets that add joy to housekeeping. High above the gas ranges gayly tinted murals pictoralize the slogan on the wall: "Well cooked foods build healthy bodies."

Just beyond the gas range display, high above the big doors at the east entrance, another caption reads: "For generations GAS has served home and industry—yet no fuel is more modern."

Now comes the first of three kitchens, colorful, graphic demonstration of the "heart of the home." First, the modern kitchen, with its suave appearance, revealing straight modernistic lines. Next comes the kitchen of tradition, so called because while it retains such things as the hooked rug on the floor and all the other knick-knacks dear to mother's heart, its modernity is emphasized with the gas range of 1934. Just beyond, and in the southeast corner of the big room, you walk into the most friendly kitchen you ever saw. Here is the kitchen for every woman—and every man, for that matter, for even the men will want to bring their guests into this kitchen.

Over the kitchens, more murals tell the purpose in this slogan: "For cooking pleasure and kitchen beauty."

On the south wall three distinct types of modern gas heating equipment are shown with murals above that depict man's search for heating comfort. High above the exhibit, across one half of the wall, runs the message: "Simple, just set this thermostat."

Adjoining this, the visitor sees the modern city where gas heat has brought about a vision of the future, minus smoke, soot, and dirt—the by-products of solid fuels. High overhead is a huge translight—an oversized figure of a man and woman—the former depicting industry, his helpmate depicting the home—gas serves them both.

Just beyond are three more types of modern gas heating equipment, and more murals above, with a message: "Gas Heat—as clean and healthful as sunshine."

In the southwest corner of the room you get a real intimate glimpse of a modern basement, just that sort of basement you might find almost anywhere. There are toys and playthings there; a boy and his sister have been playing there and have just left, so that the visitor may look in and see, among other things of interest, an all-gas boiler and air conditioner.

On the west wall, as the visitor turns north, there is another gas furnace and air conditioner, with murals above and a message: "Ready hot water and comfort go hand in hand."

At this point, the visitor may pause and relax in the comfortable lounge. On cool days, when chilly winds blow in

(Continued on page 251)

Revised Policies Adopted Governing Extension of A.G.A. Laboratory Approvals

AT its June 1 meeting the Executive Board of the American Gas Association gave final approval to certain important changes in policies governing the extension of Laboratory approvals and/or listings granted to gas burning appliances or their accessories. These revised policies were adopted as a result of years of experience and consideration on the part of member companies and committees of the Association, as well as the Laboratory groups.

Definite action on the matter was initiated in September, 1933, when the Subcommittee on Approval Requirements for Central Heating Gas Appliances unanimously passed a resolution recommending that a special committee of the Association be appointed to study the matter with the aim in view of making all revised requirements retroactive or at least limiting the period of approvals based upon any one set of standards. A special committee, composed of members of the Laboratory Managing Committee and the A. G. A. Approval Requirements Committee, was subsequently appointed in line with this thought.

After a thorough analysis of the situation it drafted recommendations which were subsequently presented to, and approved by, the A. G. A. Approval Requirements Committee, the Laboratory Managing Committee, and the Association's Executive Board. The revised policies thus adopted, and which are to become effective as of January 1, 1935, are listed below:

Revised Policies

1. That final copies of approval requirements shall be distributed to the gas industry at least nine months in advance of the date on which they are to become effective.

2. That, hereafter, all new and revised requirements adopted shall be made effective on January 1.

3. That approvals and/or listings granted following compliance with applicable approval and/or listing requirements as determined by the A. G. A. Testing Laboratory, shall be effective for a period not to exceed five years, subject to satisfactory annual inspections and compliance with other conditions specified in the existing form of the Laboratory Application for Test.

4. That, at the time of the annual inspection after the expiration of such five-year period, appliances and/or accessories must comply with the applicable approval and/or listing requirements in effect as of January 1 of the year in which the period of approval and/or listing expires, in order for approval and/or listing to be continued. Upon compliance with such requirements at the end of the five-year period, approval and/or listing shall be extended for another five-year period, subject to annual inspections and other conditions prescribed in the Laboratory Application for Test.

5. That all appliances approved before January 1, 1931, must, on or before January 1, 1936, comply with the applicable requirements in effect on January 1, 1935.

6. That all appliances approved during the calendar year 1931 must comply, on or before January 1, 1937, with the applicable requirements in effect January 1, 1936. This same procedure shall be followed in increments of 5 years each for all appliances approved and/or accessories listed during succeeding calendar years.

Accessories Included

It will be noted that the new procedure requires that all appliances approved prior to January 1, 1931, must be made to comply with the applicable standards in effect January 1, 1935, in order for approval on them to be renewed beyond that date. This, of course, does not mean that such appliances must be entirely retested. In most instances only partial tests or inspections will be required.

All appliances approved after the first of January, 1931, will be required, at the end of a five-year period, to comply with the appropriate approval standards then in effect. This will likewise apply to tested and listed accessories.

The application of this revised procedure on January 1 next seems appropriate in that ten years will have elapsed in 1935 since the establishment of the Testing Laboratory. Whereas, immeasurable benefits have accrued to the gas industry and the public as a direct result of the Laboratory's testing and approval program, it is believed that even greater benefits will be derived in the future through application of the new policies outlined above.

Bon, Henry!

When one of the department stores wanted a new sort of electric stove demonstrated recently, they thought it would be a good idea to have Henri, of Radio City's new French restaurant, prepare a delicious something on it before the very eyes of shoppers, and this the maestro readily consented to do. At the appointed hour, after speaking briefly to the assembled ladies on the joys of cooking, he set to work, and soon a sauce of onions was being born. After a time, however, the ladies began to notice that something was wrong; Henri seemed dazed, fiddled with the stove, looked about helplessly. All was explained when a blushing manager appeared and revealed that a fuse had blown out. It had been repaired, however, and the demonstration could now proceed. Henri stared at him coldly. "My dish is ruined," he announced. "We shall begin again." Once more things progressed. Into a fresh pan Henri dropped some butter; then the store was filled with the unaccustomed fumes of garlic; and then, grating onions with Gallic vigor, Henri spilled onion juice onto the wrong part of the stove and once again a fuse blew out. For Henri, this was too much. *"Mesdames!"* he cried. "Never, never cook upon the electricity! I never use it! Follow my example! If you cannot have the charcoal, use the wood. If you have not the wood, use the gas. But electricity —never! As you see, the electricity, it is *impossible! Au revoir, Mesdames."* Henri left the store, forever.

(Reprinted from The New Yorker, June 2, 1934.)

Gas Plays Important Part At Master Plumbers' Show

By H. M. BRUNDAGE, JR.
Washington Gas Light Co.

REPRESENTED by an elaborate display of modern gas appliances including several makes of ranges, automatic gas water heaters, automatic gas house heating units and a gas refrigerator, the gas industry played an important part May 28-31 at the Fifty-Second Annual Convention of the National Association of Master Plumbers held at the Washington Auditorium at Washington, D. C.

Approximately 5000 master plumber delegates from every large city in the country and daily throngs of Washington residents inspected the $1,000,000 display of plumbing, heating and air-conditioning equipment in 28,000 square feet, comprising the entire ground floor of the auditorium, which was arranged as an important part of the convention.

Through the cooperation of the American Gas Association and the following well-known gas companies and gas appliance manufacturers, the exhibit of gas appliances for the gas industry, arranged and constructed through the facilities of the Washington Gas Light Company, was made possible:

Consolidated Gas Electric Light & Power Co. of Baltimore, Hagerstown Light & Heat Company, Citizens Gas Company, Electrolux Refrigerator Sales, Inc., Waynesboro Gas Company, Glenwood Range Company, The Bryant Heater & Manufacturing Company, American Gas Products Corporation, Edgar Morris Sales Company, The Cleveland Heater Company, Geo. D. Roper Corporation, American Stove Company, Standard Gas Equipment Corporation, Washington Gas Light Company.

The display occupied 410 square feet across the entire front of the hall near the entrance, which also was used as the main exit, making this space one of the most dominating and advantageous of the many booths occupied.

Gas industry display at Annual Convention of National Association of Master Plumbers in Washington, D. C.

Built along modernistic lines, but constructed to allow a complete panoramic view of all of the appliances on display, the gas exhibit was colorfully backed by crepe paper in a fine, pleated cloth effect to accentuate the lines and color schemes of the appliances in the foreground. The result was a striking arrangement of time and labor-saving home appliances which created considerable interest among both delegates and interested Washington spectators.

On a colored platform in the center of the display was a large Electrolux refrigerator, flanked on the left by a Pittsburg automatic gas water heater and on the right by a Rex heater, also on colored bases.

To the left of the Pittsburg were two of the latest type ranges, the Magic Chef, product of the American Stove Company and the Glenwood, product of the Glenwood Range Company.

To the right of the Rex heater on the right-hand portion of the display were two more tabletop ranges, the Roper, product of the George D. Roper Corporation, and the Oriole, product of Standard Gas Equipment Corporation.

Two gas boilers, representative products of the Bryant Heater & Manufacturing Company and the American Gas Products Corporation, occupied equally prominent positions. The names of the participating companies were displayed on panels on either side of the front of the display while directly across the top foreground were the words in bold raised letters "The Gas Industry."

Representatives of the Washington Gas Light Company were constantly in attendance to explain the new features of all of the appliances to the spectators.

The entire convention was declared a huge success, with interesting talks by Robert J. Barrett, president of the Master Plumbers' Association; Patrick J. Hurley, former Secretary of War; Russel G. Creviston, sales promotion manager of the Crane Company, Chicago; Major Joel I. Connolly, director of technical service and research of the Chicago Board of Health; James D. Dusenberry, assistant deputy administrator of the N. R. A.; Stephen F. Voorhees, of the code authority of the construction industry; Walter J. Kohler, chairman of the code authority of the plumbing fixtures industry; William J. Spillane, of the code committee of the plumbing wholesalers' industry; George H. Drake, chairman of the code committee of the plumbing contracting industry, and others whose views on the advancement of plumbing and other modern home improvements, together with the outline of business pertinent to the plumbing industry, were timely and profitable to those who attended.

Operational Characteristics of Domestic Gas Appliance Pressure Regulators

By HARRY W. SMITH, JR.
A. G. A. Testing Laboratory

GAS pressure regulators or governors, by means of which pressures on gas supplies are held constant irrespective of rates of flow and variations in gas pressure before the device, have long been in common use in fields of gas distribution and utilization. The complex networks of pipe lines and mains which constitute the gas distribution systems of the various cities of this country are practically all dotted with gas governors or regulators to make possible the distribution of gas to consumers at a relatively uniform pressure. Similar but smaller regulators have also been extensively used for some time as accessories on gas supply lines of gas appliances such as furnaces, boilers, and commercial and industrial gas installations. As a matter of fact, the American Gas Association requires that gas pressure regulators be supplied as regular equipment on all central heating gas appliances and unit heaters approved by its Testing Laboratory.

The pressure of the gas supply in any community is held relatively constant by means of pressure regulators or district governors installed in the gas distribution system at various locations. Furthermore, rules and regulations of Public Service Commissions in most states require gas companies to maintain gas pressures, on service lines to customers' premises, within very narrow limits. Appliance users are, therefore, assured not only of a constant gas supply but a supply at a relatively constant pressure. In addition to this fact, domestic gas appliances approved by the American Gas Association Testing Laboratory are tested at a uniform adjustment over a wide range of gas pressures exceeding considerably the customary variations of pressure experienced in the field, and are required to meet rigid performance standards imposed under these conditions. This insures a high degree of flexibility of performance on those appliances not equipped with pressure regulators and indicates that their performance should be even more satisfactory when installed under actual field conditions.

There are, however, certain types of appliances which must be furnished with gas pressure regulators as a part of the regular equipment and controls supplied with them, in order to be approved by the Testing Laboratory. In testing such equipment the various test pressures specified in the approval standards are applied at the inlet side of the regulator. The result is that practically uniform pressures are maintained on the outlet side and, therefore, at the burners. This enables the manufacturer to employ higher gas input ratings and consequently increase the heating capacity of the appliance over and above what it would be if no gas pressure regulator were supplied on the appliance.

If no regulator were employed the appliance would have to meet the rigid combustion requirements of the American Gas Association throughout the wide range of gas pressure at the burners corresponding to and resulting from the gas supply pressure range specified for test and extending from 50 per cent below the average or normal gas pressure to 50 per cent above normal. This in many cases, if not all, would necessitate a reduction in the manufacturer's approved gas input rating, since the approved rating for any appliance is based upon its actual consumption at normal gas pressure.

Where no regulator is supplied, therefore, approved appliances must meet the combustion requirements at a rating approximately 22 per cent above the normal approved rating, which is equivalent to the input resulting from an increase in gas pressure to 1.5 normal. By installing regulators on appliances and thus eliminating the necessity of tolerances in appliance design to compensate for varying pressures, higher input ratings and consequently higher appliance capacities may be secured without running into combustion difficulties.

Furthermore, higher appliance efficiencies may also be obtained in many cases if regulators are supplied on the appliances, especially in the case of some types of water heaters, boilers, basement furnaces, floor furnaces, unit heaters, etc. This may be accomplished since the flue sizes and baffling can be more precisely engineered to suit a gas input rating which, due to the control effected by the regulator, remains

Figure 1
Apparatus used in regulation and capacity tests on domestic gas appliance pressure regulators, A.G.A. Testing Laboratory

practically constant regardless of increases in line pressure.

Similarly, efficiency and other performance characteristics of gas ranges may often be improved by equipping them with pressure regulators and designing the ranges accordingly. The use of a regulator and, consequently, the maintenance of an approximately uniform gas pressure on the manifold, enables the manufacturer, in many cases, to place the top burners nearer the grates or cooking surface than would be possible if the range had to meet the combustion requirements over a wide range of manifold pressures.

In recent years it has become increasingly apparent that gas pressure regulators may be advantageously employed on other appliances in addition to boilers, furnaces, and unit heaters, where, as a condition of approval, they must be supplied as an integral part of the appliance. The use of small but effective types of pressure regulators on such appliances as water heaters, space heaters, and gas refrigerators is becoming more prevalent.

It is highly desirable, therefore, that gas appliance and regulator manufacturers, as well as distributors and purchasers of domestic gas-burning equipment understand and be fully familiar with the design, construction, and performance characteristics of gas appliance pressure regulators. It is the purpose of this article to discuss in a concise manner those characteristics of domestic gas appliance pressure regulators which govern their value and utility. Since the operational features of present-day appliance regulators are not always what they should be, and since their functions are so very important to the customer, it appears that a discussion of this subject citing some of the more important results secured by the Laboratory in its investigations, should be of assistance.

Domestic gas appliance pressure regulators operate on exactly the same general principles as do the more familiar distribution system regulators and governors of larger size. Gas traverses the device through a valve actuated by direct connection to a movable diaphragm, usually of oiled or treated leather. The space below the diaphragm communicates with the gas stream, customarily through a small

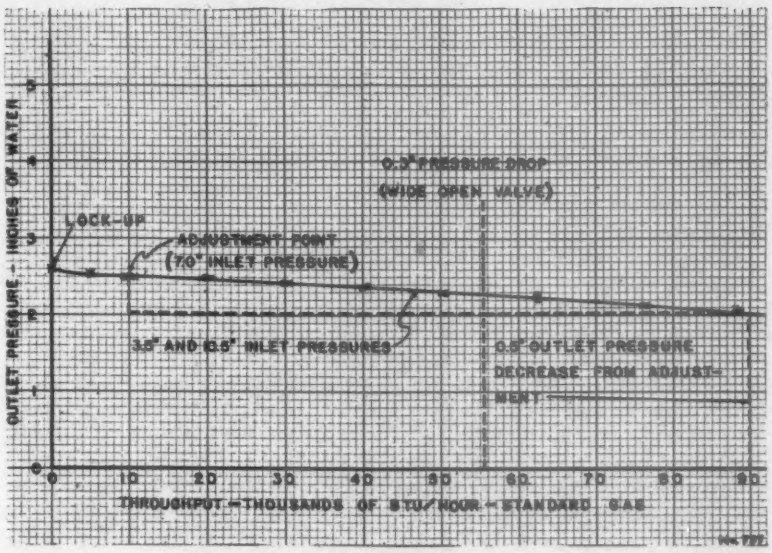

Figure 2
Regulation Curves for Regulator B-DW-1 (½")

orifice or tube opening into the outlet passage of the device.

Thus the force upward on the diaphragm, and thereby the closing force acting upon the valve mechanism, is regulated by the gas pressure on the outlet side of the regulator. The force down on the diaphragm which acts to open the valve is supplied by some means of mechanical loading. Springs and dead weights are the most frequently used.

To allow ample movement of the diaphragm, of course, the space above it must be vented to the atmosphere, chimney, or burner box. The compressive force of the spring loading, or the weight of the dead weight loading, in addition to the weight of the diaphragm and connected valve system, determines the pressure maintained on the outlet side of the control. In operation, should the outlet pressure tend to fall for any reason, the upward or closing force on the diaphragm will decrease, the diaphragm move downward, and the valve open more widely. This action will reduce the pressure loss through the accessory and tend to maintain the outlet pressure constant.

If, however, the inlet pressure should at any time fall below the adjustment pressure of the regulator, the outlet pressure will, of course, fall below the predetermined figure. This will rarely, if ever, happen, however, since the regulator adjustment is customarily considerably below the prevailing gas pressure at the point of installation. Conversely, should the outlet pressure tend to rise, the upward or closing force on the diaphragm will increase, the diaphragm move upward, and the valve throttle. This, of course, will increase the resistance of the system to the flow of gas and, consequently, tend to maintain the outlet pressure constant.

At the point of equilibrium during operation when the outlet pressure is at (or near) the adjustment point, the forces above and below the diaphragm are equal and the valve has no tendency to move. In other words, as a result of the controlled downward force upon the diaphragm, the diaphragm will so adjust its placement that the valve assumes a position inducing sufficient resistance to the flow of gas to maintain an outlet pressure, and hence an upward force on the diaphragm just adequate to balance the total constant (or nearly constant) loading.

There are, naturally, many elements of regulator design that govern the degree of constancy with which outlet pressures are maintained at a predetermined figure under various conditions of inlet pressure, rate of flow, and usage. No known regulator is capable of yielding exactly the same outlet pressure for all attainable inlet pressures and rates of throughput. Notwithstanding many closely approxi-

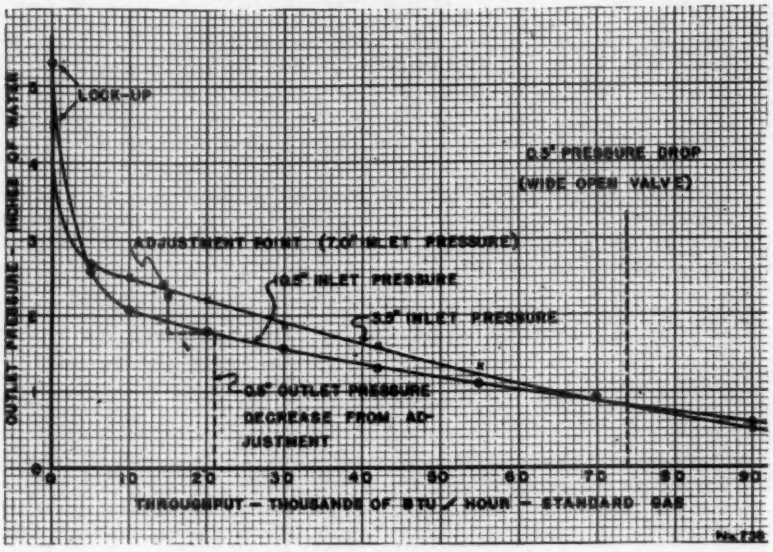

Figure 3
Regulation Curves for Regulator G-S-1 (½")

mate perfect operations, even as others, apparently constructed on sound principles, fall far short of doing.

Some of the fundamental features of proper regulator construction are fairly well known and have been presented from time to time. One very excellent discussion touching on the design of gas appliance regulators has recently been offered by Benton.[1] Others such as La Violette,[2] Johnston,[3] MacLean,[4] Wehrle,[5] Donkin,[6] and Waring,[7] have published treatises which should be of interest to those desiring a comprehensive knowledge of regulator design and application.

Such factors as the dimensions of the valve stem, the general design of the valve and seat, the properties and method of suspension of the diaphragm, the type of diaphragm loading, the construction and location of the pressure tapping communicating to the lower side of the diaphragm, the size of inlet and outlet passages, the manner of application of secondary diaphragms (if any), provisions for alignment, and other items play important roles and influence the performance characteristics of regulators.

However, a detailed discussion of these items and their effects would be long and complicated and is beyond the scope of this paper. The methods and details of regulator design are of but passing concern to those who employ or distribute regulators. Their interest lies primarily in a method of determining the characteristics of operation of existing domestic gas appliance pressure regulators, and thereby of ascertaining the desirability of such suggested accessories for any given application.

Some 69 gas appliance pressure regulators of representative types, in many sizes, and produced by various manufacturers have been tested at the A. G. A. Testing Laboratory in connection with the development of national standards covering the construction and performance of such equipment. From these tests it has been found that most information concerning the performance characteristics of regulators can be derived from what may be called a series of "outlet pressure-throughput" curves. Plots of this nature may be easily obtained and reveal much of value in considering the suitability of different small governors for any given task. Figures 2, 3, and 4 illustrate such curves drawn from actual test data.

The manner of obtaining these curves is relatively simple. It is necessary only that gas be passed through the test regulator while connected in a system such that accurate adjustment of inlet pressure and throughput to any desired point is possible. This, of course, makes it mandatory that flexible and precise valve systems precede and follow the test accessory, and that appropriate means of disposing of the test gas and accurately measuring the quantity passed per unit of time be provided. Static pressure tappings before and after the regulator must, of course, also be made in smooth pipe not too near connections and devices supplied for accurately measuring the pressures obtained. Finally, to reduce all data to a standard base, it is necessary to know the specific gravity of the test gas.

One of the arrangements of equipment used at the A. G. A. Testing Laboratory is illustrated in Figure 1. The Schilling Apparatus for determining specific gravities is shown on the table and to the right of the differential slope gage. In the case illustrated, a large dry meter was used for throughput measurements, and the gas from the outlet of the regulator being tested was disposed of by venting to the outside atmosphere. Orifice meters and wet test meters for rate measurement have also been successfully employed, and the test gas disposed of by burning. Pressures have been gaged by means of open-end U-tube manometers, differential slope gages, and an A. G. A. modification of the Toronto micromanometer.

From curves such as those illustrated much may be learned, but before they can be properly interpreted the significance of various possible curve forms must be appreciated.

The regulator producing the plot of Figure 2 operated very satisfactorily; better than any of the other 68 tested. It will be noted that, irrespective of the rate at which gas flowed through the regulator in point, the outlet pressure remained absolutely constant within the limits of experimental error as the inlet pressure was varied from 3.5 inches water column (½ of the inlet pressure at which the device was

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[1] W. E. Benton, "Theory of Small Gas Governors," Gas Journal (London), Feb. 7, 1934, pp. 314-20.
[2] Wm. A. La Violette, "Governors and Regulators," Western Gas, August, 1932, pp. 110-22.
[3] A. W. Johnston, Jr., "House Governor Performance," Gas Age-Record, Apr. 1, 1933, pp. 325-7.
[4] Allen D. MacLean, "Modern Pressure Regulation," Gas Age-Record, January 16 and 23, 1932. Also "Performance Characteristics of Service Regulators," Gas Age-Record, May 26, 1934, pp. 507-10.
[5] George Wehrle, "Gas Pressure Regulation," Amer. Gas Jr., May, June, and July, 1931.
[6] C. Bryan Donkin, "Diaphragm Gas Governors," Gas Journal (London), Nov. 2, 1932, pp. 329-30.
[7] C. H. Waring, "Development of Regulators and Pressure Regulation," American Gas Journal, May, 1934, pp. 93-7.

adjusted) to 10.5 inches water column (1½ of the adjustment inlet pressure).

Further, this accessory, having been adjusted to yield an outlet pressure of 2.52 inches equivalent water column at a throughput of 10,000 B.t.u. per hour of standard gas (500 B.t.u. per cubic foot and 0.60 specific gravity), maintained that outlet pressure within 0.50 inch water column as the throughput was varied from 0 to 90,000 B.t.u. per hour. The regulator, the performance of which is illustrated by Figure 3, on the other hand, exhibited very bad characteristics. Aside from being incapable of holding its outlet pressure constant over any reasonable range of throughputs, this regulator was found to permit the outlet pressure to fluctuate considerably at any usable fixed gas rate, as the inlet pressure was varied. In addition, it will be observed that the regulator represented by Figure 3 required considerable force to seat the valve without leakage as evidenced by the poor retention of outlet pressure at the point of "no-flow" or "lock-up" (the vertical intercept). These "lock-up" or "no-flow" pressures are secured by rapidly closing off the outlet of the test regulator subsequent to the tests at the lowest throughput.

From a consideration of the fundamental functions which regulators are designed to perform, it may be seen now that "regulation" or "outlet pressure-throughput" plots should exhibit the following characteristics:

1. The divergence between the two curves determined at different inlet pressures (one at ½ the inlet pressure at which adjustment is made; the other at 1½ of that pressure) should not be excessive at any expected rate of throughput. At the A.G.A. Testing Laboratory 0.50 inch equivalent water column is considered to be the limit. Thus, the fundamental purpose of a regulator, to guard against variations in line pressure, is partially insured.
2. The fall or rise of outlet pressure from that for which the device is adjusted must not be too great as the throughput is varied. In other words, the slope of the curves plotted must not be excessive. At the Laboratory the maximum difference between the outlet pressure of adjustment and any outlet pressure noted in the range of throughputs over which good performance is expected, must not exceed 0.50 inch water column. Otherwise, as appliances are turned down or up, or as various combinations of two or more appliances on the same regulator are operated at different times, outlet pressures will fluctuate even though inlet pressure changes have no effect.
3. Valves should seat well, and, therefore, the rise at the left end of either regulation curve should not be to a pressure more than 1 or 1½ inch water column greater than that outlet pressure which the accessory is adjusted to yield. Should the "lock-up" pressure be too great (or, as frequently happens, be unattainable), the necessity of developing a considerable pressure in a closed outlet line before sufficient force is exerted to tightly seat the valve is indicated.

From all three of the standpoints noted above, if a regulator then exhibits acceptable characteristics within limits of throughput and inlet pressure variations which are reasonable for the installation and gas supply at hand, it may be concluded that the regulating characteristics of the device are satisfactory.

Notwithstanding, there is one other point to be carefully weighed. Should the inlet pressure for some external reason fall to a point below the outlet pressure which the device is intended to yield, the regulator valve will, obviously, drop to a wide open position. This function all governors should most decidedly perform, and, after so doing, offer as little resistance to the flow of gas as possible until the inlet pressure recovers sufficiently to again exceed the expected outlet pressure.

The magnitude of a regulator's obstruction to gas flow when in the wide open position may not be considered as a "regulating" property of the device. Rather, it should be treated as a "capacity" characteristic; but, whatever its category, it is an important item to consider when selecting a gas appliance regulator for some known application.

This vital capacity of domestic gas appliance pressure regulators while in the wide open position may be determined in the conventional manner,[8] so long as the inlet pressure upon the regulator is kept below the outlet pressure for which the unit is adjusted, and the valve is, thereby, held wide open purely as a result of normal operation.

At the Testing Laboratory throughputs in B.t.u. per hour of standard gas (500 B.t.u. per cu.ft. and 0.60 specific gravity) at which wide open regulator pressure drops in excess of 0.30 inch equivalent water column are obtained are considered to be too great for safe operation. This limit has been established since, at all times, ample pressure must be maintained at the orifices or appliance burners, and when meter pressures are abnormally low, low resistances of piping and controls are required to approach this end.

From the above discussion it is seen

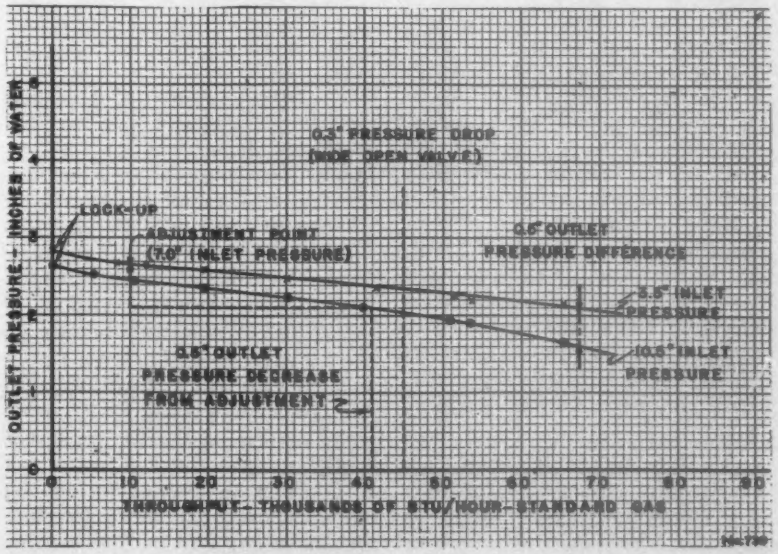


Figure 4
Regulation Curves for Regulator C-DW-3 (½")

[8] John Corsiglia and R. C. Gregg, "Determination of Pressure Drop Through Gas Fittings and Controls on Gas Appliances," American Gas Association Monthly, March, 1932.

that, by determining, as explained, both the regulation curves and the capacity at which a pressure drop of 0.30 inch water column is obtained with the valve wide open, all that need be known about the performance of a domestic gas appliance pressure regulating control to appraise its suitability for inclusion in the gas line to a given appliance is revealed. It is likewise apparent that almost any regulator will be suitable for use within a limited range of throughputs and inlet pressures.

The items that really characterize the worth of a pressure regulator are the extent of the variations in throughput and inlet pressure which are permissible consistent with reasonably constant outlet pressures.

For example, the range of permissible throughputs for the regulator of Figure 2 extends from 0 to 55,000 B.t.u. per hour; i.e., in this region none of the above-noted three regulation principles nor the stipulation on wide open valve capacity is violated. With the regulator of Figure 3, however, acceptable performance may be assured only to 21,000 B.t.u. per hour* at the most, and the characteristics at low rates of throughput (near "lock-up") are poor.

In Figure 4 are given the plots for a regulator whose operation is satisfactory to 41,000 B.t.u. per hour. On this chart the upper throughput limit of acceptable performance from each of the three important standpoints is indicated. From the point of view of a sufficiently small variation of outlet pressure with inlet pressure, operation was not found satisfactory at throughputs above 67,200 B.t.u. per hour; on the basis of a sufficiently small pressure drop through the device with the valve in the wide open position, operation was not deemed acceptable above 45,000 B.t.u. per hour, and from the standpoint of a sufficiently small variation of outlet pressure with throughput, operation was poor above 41,000 B.t.u. per hour.

The lowest of these three limits, of course, fixes the maximum allowable rating of appliances upon which this regulator may be installed and reliable operation expected under all conditions.

It is noteworthy to observe at this point that spring type regulators are usually limited, as regards the maximum size of appliance upon which they may be successfully installed, by a large variation of outlet pressure with different rates of throughput, whereas dead weight type regulators are more generally limited in application by the capacity at which their resistance to the flow of gas with valves wide open becomes objectionable.

This truth arises, of course, from the variable diaphragm loading afforded by springs such as used in the former type as the placement of diaphragm and valve changes. The variation of outlet pressure with inlet pressure at a given throughput is, in the case of practically all regulators of the domestic gas appliance type, satisfactory at rates of gas flow far in excess of those that may be permitted on the basis of the regulation curves' slope or the open valve capacity.

With respect to construction, there are, of course, numerous items to be considered in selecting a regulator for a given gas appliance. These concern, in the main, the quality of workmanship, the size and shape of the control, the nature and range of adjustment, the provision for venting the chamber above the diaphragm, and other more or less obvious items which are primarily matters of individual design. Certain rarely considered features are, however, often very important, and may not be overlooked.

Chief among these is the matter of diaphragm "sticking." By supplying ribs on the interior of the diaphragm-containing chamber, or by mechanically limiting the possible motion of the diaphragm so that it may not come into contact with either the top or bottom walls of the diaphragm housing, manufacturers may easily obviate any "sticking" of the diaphragm such as will render the device inoperative.

Similarly, the means provided for insuring proper seating of the valve should be inspected, and attention accorded to the immunity of critical parts from corrosive action. Finally, the vent connection communicating to the space above the diaphragm should be suitably bossed and tapped so that, if desired, connection of it can be made to the outside atmosphere, fire-box, or flueway, and thus all possibility of the escape of raw gas into the room in which the appliance is located eliminated in the event of diaphragm failure.

Though it is highly desirable for purchasers of domestic gas appliance pressure regulators to know the performance characteristics and constructional features of the accessories they anticipate buying, a complete list of pertinent facts such as here outlined is rarely available. Further, all the required information may not be secured by inspection. Therefore, reliance must be placed upon partial tests, experience, and hearsay alone.

Some method by means of which assurance could be had that pressure regulating equipment complies with reasonable standards of operation and design would be more than welcome. This need will shortly be supplied by the American Gas Association Listing Requirements for Domestic Gas Appliance Pressure Regulators. These standards have been developed as the result of several years of careful research and have been adopted only after being submitted to the industry in general for criticism and comment and completely approved thereafter by nationally eminent committees organized for just such purposes. These requirements specify construction and performance tests which, when met, attest to high degrees of safety, performance, durability, and convenience. Compliance authorizes A. G. A. listing, denoted by the three block letters A. G. A. on the accessory.

When, in the near future, the testing of domestic gas appliance pressure regulators is begun, there will appear in the Association's printed list of certified equipment the manufacturer's rated capacity for each A. G. A. listed regulator.

It is important that the requirements on the basis of which listing is granted demand that this manufacturer's rating not exceed that which, as determined by the Laboratory, marks the upper limit of absolutely acceptable regulator operation under all reasonable

(Continued on page 251)

* Although it is true that this value would be elevated if the original adjustment of the regulator had been made with a greater throughput, the adjustment point used conforms with a schedule of appropriate adjustment throughputs, one for each size of domestic appliance pressure regulator, fixed as a result of extensive researches and surveys conducted by the A.G.A. Testing Laboratory. The reasons for setting up the particular schedule adopted are given in Laboratory Report No. 732.

Affiliated Association Activities

Canadian Gas Association

J. C. Dawson

OFFICIALS of the Canadian Gas Association pronounced their 27th annual convention a splendid success at its conclusion June 5 in Montreal. A representative gathering of more than 200 delegates assembled at the Hotel Windsor to participate in the two-day session. Many prominent guests from the United States were in attendance, including Major Alexander Forward, managing director of the American Gas Association, who extended the greetings of the Association, and F. M. Goodwin, president of the New England Gas Association.

The delegates were welcomed by the association's retiring president, D. G. Munroe, vice-president and managing director of the Montreal Coke and Manufacturing Company. Mr. Munroe pointed out that the gas industry was showing signs of improvement and that notwithstanding the depression some companies were reporting encouraging increases in the output of gas. He concluded by advising the public to purchase only standard appliances that had been approved in the Association's laboratories.

Mr. Munroe presented the meritorious service medal awards to employees who had been conspicuous during the year in saving human life. The recipients were: Thomas Morillon, gas department, Quebec Power Company, bronze medal and certificate; E. T. Mills, Montreal Coke and Manufacturing Company, bronze medal and certificate; Patrick Sweeney, gas department, Montreal Light, Heat and Power Company, bronze medal and certificate, and L. T. Temple, Montreal Light, Heat and Power Consolidated, gold bar for meritorious service in lifesaving in Montreal, in 1933, to be added to a gold medal presented to him at the 1933 convention.

Officers elected for the ensuing term were: President, J. C. Dawson, superintendent of the gas department, Quebec Power Company; first vice-president, John Keillor, gas engineer, British Columbia Electric Railway Company, Vancouver; second vice-president, W. H. Munro, general manager, Ottawa Gas and Electric Company, Ottawa; secretary-treasurer, G. W. Allen, gas survey engineer, Toronto; executive committee—Arthur Hewitt, Toronto; J. M. H. Young, London; Hugh McNair, Winnipeg; V. S. McIntyre, Kitchener; D. G. Munroe, Montreal; J. J. Humphreys, Montreal; K. L. Dawson, Halifax, and T. P. Pinckard, Hamilton.

The annual dinner was a feature of the convention. The guest-of-honor on this occasion was Col. Wilfred Bovey, O.B.E., D.Litt., director of extra-mural relations, McGill University, who spoke on the history of Canada and the early days of gas lighting in Montreal.

Quebec City was chosen for the next annual convention, with a definite time to be selected later. The fiscal year of the Canadian Gas Association was changed to correspond to the calendar year.

Papers presented at the meeting included: "Employee Education, Looking Toward Sales, Goodwill and Public Relations," by S. R. Severson, vice-president, Dominion Natural Gas Company, Limited, Buffalo, N. Y.; "Purification of Gas Works Waste Water," by Allyn C. Taylor, president, Consumers Gas Company, Reading, Penn.; "Servicing of Gas Holders," by Herbert W. Alrich, engineering department, Consolidated Gas Company of New York, New York City; "Operating and Checking a Waterless Gas Holder," by H. C. Osler, superintendent, gas stations, Montreal Light, Heat and Power Company, Montreal; "Sales Promotion Work for the Future of the Gas Industry," by M. L. Kane, general sales manager, Union Gas Company of Canada, Limited, Chatham, Ont.

Other papers were: "Arguments for and Against the Use of Rubber Gaskets for Joint-Making Purposes," by Jacob D. von Maur, engineer of distribution, Consumers' Gas Company of Toronto, Toronto; "Producer Gas Fuel Practice at the Plant of the Montreal Coke and Manufacturing Company," by L. T. Calhoun, chief chemist, Montreal Coke and Manufacturing Company; "Promotional Rates for Gas Service," by O. L. Maddux, industrial engineer, United Gas and Fuel Company, of Hamilton, Limited, Hamilton, and "The Service Pipe," by Jacob D. von Maur, engineer of distribution, Consumers' Gas Company, Toronto.

The session concluded with a visit to the by-product coking plant of the Montreal Coke and Manufacturing Company. A trip was also made to Fort Chambly.

Pennsylvania Natural Gas Men's Association

G. W. HARR, of Fairmont, W. Va., succeeds F. F. Schauer, of Pittsburgh, as president of The Pennsylvania Natural Gas Men's Association, it was announced following a meeting of directors. Mr. Harr is manager of the gas department of the Monongahela-West Penn Public Service Company and Mr. Schauer is vice-president of the Equitable Gas Company.

Convention Calendar

SEPTEMBER

1- 4 **International Gas Union**
Zurich, Switzerland

9 **American Trade Association Executives**
Wernersville, Pa.

11-13 **Pacific Coast Gas Association**
Del Monte Hotel, Del Monte, Calif.

24-28 **American Transit Association**
Cleveland Public Auditorium, Cleveland, Ohio

OCTOBER

14-19 **American Dietetics Association**
Mayflower Hotel, Washington, D. C.

Wk. 29 **American Gas Association Convention and Exhibition**
Atlantic City, N. J.

H. H. Phillips, secretary of The T. W. Phillips Gas and Oil Company, Butler, was elected vice-president, and B. H. Smyers, Jr., attorney for the Equitable Gas Company, was re-elected secretary and treasurer.

Directors, in addition to the above, are: T. B. Gregory, vice-president, Columbia Gas and Electric Company; S. W. Meals, president, The Carnegie Natural Gas Company; B. D. Phillips, vice-president, T. W. Phillips Gas & Oil Company; F. R. Phillips, president, The Philadelphia Company; George W. Ratcliffe, president, The Manufacturers Light & Heat Company; J. French Robinson, vice-president, The Peoples Natural Gas Company; Mr. Schauer; J. B. Tonkin, president, The Peoples Natural Gas Company; George E. Welker, president, The United Natural Gas Company, and George Wittmer, Jr., treasurer, The American Natural Gas Company.

Michigan Gas Association

THE forty-first annual convention of the Michigan Gas Association, held June 19 and 20 at the Hotel Pantlind, Grand Rapids, Michigan, attracted delegates from many parts of the State, as well as a score or more of prominent men from other sections of the country. The meeting was held simultaneously with the annual convention of the Michigan Electric Light Association. Many

subjects of national significance were discussed by the utility men.

The opening session was a joint meeting of the gas and electric associations, at which problems common to both industries were discussed. The introductory address was delivered by A. C. Marshall, chairman of the Utilities Information Bureau Committee. Mr. Marshall was followed by Arthur W. Stace, who spoke on "Natural Gas in Michigan." The Tennessee Valley situation, which is arousing nation-wide controversy, was discussed by Frank A. Newton, of the Commonwealth & Southern Corp., New York. The session concluded with an address by Alexander Forward, managing director of the American Gas Association, New York, in which he summed up the national utility outlook.

Problems confronting the gas industry exclusively were taken up at the second meeting, which opened with an address by Walter E. White, president of the Michigan Gas Association. New officers elected at this time were: President, D. W. Hayes, of The Detroit Edison Co., Port Huron; vice-president, D. A. Frazer, Jr., of Battle Creek; secretary-treasurer, A. G. Schroeder, of Grand Rapids.

Information on the NRA Code for the Manufactured Gas Industry was presented by Major Forward. An important paper, presented by Professor Alfred H. White, of the University of Michigan, outlined the Fellowship Work at Ann Arbor. Professor White has directed the Gas Fellowship work at the University of Michigan since its inception more than thirty years ago.

Other subjects covered were: "The Coke Situation" by Howard Pett; "Oil Gas as a Substitute for Natural Gas," by D. E. Herringshaw; "Progress in Control of Gum Deposits," by George E. Ludwig; "House Heating Campaign in Saginaw and Bay City," by H. C. Haroldson.

Breakfast for the ladies was served in the Home Service Department of the Grand Rapids Gas Light Company.

Attractive entertainment features were included in the program.

Associations Affiliated With A. G. A.

Canadian Gas Association
Pres.—J. Chesley Dawson, Quebec Power Co., Quebec, Canada.
Sec.-Tr.—G. W. Allen, 21 Astley Avenue, Toronto.

Empire State Gas and Electric Association
Pres.—Alfred H. Schoellkopf, Niagara Hudson Power Corp., Buffalo, N. Y.
Chairman, Gas Section—A. M. Beebee, Rochester Gas & Electric Corp., Rochester, N. Y.
Sec.—C. H. B. Chapin, Grand Central Terminal, New York, N. Y.

Illinois Public Utilities Association
Pres.—Bernard J. Mullaney, The Peoples Gas Light & Coke Company, Chicago, Ill.
Sec.—J. R. Blackhall, Suite 1213, 79 West Monroe St., Chicago, Ill.

Indiana Gas Association
Pres.—R. S. Brunner, Indiana Gas Utilities Co., Richmond, Ind.
Sec.-Tr.—P. A. McLeod, New Castle, Ind.

Michigan Gas Association
Pres.—D. W. Hayes, The Detroit Edison Co., Port Huron, Mich.
Sec.-Tr.—A. G. Schroeder, Grand Rapids Gas Light Co., Grand Rapids, Mich.

Maryland Utilities Association
Pres.—W. A. Tobias, Hagerstown Light & Heat Co., Hagerstown, Md.
Sec.—C. R. Burger, 26 South Jonathan St., Hagerstown, Md.

Mid-West Gas Association
Pres.—C. T. Williams, Sioux City Gas & Electric Co., Sioux City, Iowa.
Sec.-Tr.—Roy B. Searing, Sioux City Gas & Electric Co., Sioux City, Iowa.

Missouri Association of Public Utilities
Pres.—Fred Karr, St. Joseph Gas Co., St. Joseph, Mo.
Sec.-Tr.—N. R. Beagle, Missouri Power & Light Co., Jefferson City, Mo.
Asst. Sec.—Jesse Blythe, 103 West High St., Jefferson City, Mo.

New England Gas Association
Pres.—F. M. Goodwin, Boston Consolidated Gas Co., Boston, Mass.
Exec. Sec.—Clark Belden, 41 Mt. Vernon St., Boston, Mass.

New Jersey Gas Association
Pres.—E. J. Menerey, Peoples Gas Co., Glassboro, N. J.
Sec.-Tr.—G. B. Webber, Public Service Electric and Gas Co., Newark, N. J.

Ohio Gas and Oil Men's Association
Pres.—L. K. Langdon, Union Gas & Electric Co., Cincinnati, Ohio.
Sec.-Tr.—Wm. H. Thompson, 811 First National Bank Bldg., Columbus, Ohio.

Oklahoma Utilities Association
Pres.—H. B. Cobban, Northeast Oklahoma Railroad Co., Miami, Okla.
Mgr.—E. F. McKay, 1020 Petroleum Bldg., Oklahoma City, Okla.

Pacific Coast Gas Association
Pres.—Geo. P. Egleston, H. R. Basford Co., San Francisco, Calif.
Mang. Dir.—Clifford Johnstone, 447 Sutter St., San Francisco, Calif.

Pennsylvania Gas Association
Pres.—T. W. McDonald, Pennsylvania Gas & Electric Co., York, Pa.
Sec.—Frank W. Lesley, Pennsylvania Gas & Electric Co., York, Pa.

Pennsylvania Natural Gas Men's Association
Pres.—G. W. Harr, Monongahela-West Penn Public Service Co., Fairmont, W. Va.
Sec.-Tr.—B. H. Smyers, Jr., 435 Sixth Ave., Pittsburgh, Pa.

Southern Gas Association
Pres.—W. W. Winter, Atlanta Gas Light Co., Atlanta, Ga.
Sec.-Tr.—S. L. Drumm, New Orleans Public Service Inc., New Orleans, La.

The Public Utilities Association of Virginia
Pres.—T. Justin Moore, Va. Elec. & Power Co., Richmond, Va.

Wisconsin Utilities Association
Pres.—G. V. Rork, Northern States Power Co., Eau Claire, Wis.
Exec.-Sec.—J. N. Cadby, 135 West Wells St., Milwaukee, Wis.

Philadelphia Company Has Golden Jubilee

FIFTY years of public service was celebrated last month by the Philadelphia Company, Pittsburgh, Pa. Interesting ceremonies participated in by the employe body of more than 8,000 marked the event. More than 60 per cent of the employees have been with the organization upwards of ten years; 25 per cent upwards of twenty years. Oddly enough, the "Philadelphia Company," has nothing to do with the city of that name.

A feature of the celebration was the honoring of sixteen retired employees who had served with the organization, or its predecessors, more than half a century ago, and of E. E. Omohundro, who after fifty years service, is still filling a responsible position with the company.

The public utility situation in Pittsburgh is unique—electricity, street railways and buses, steam heating, and about half of the natural gas supply under one parent company and under one single management. Separate functional operating companies, namely Duquesne Light, Pittsburgh Railways, Pittsburgh Motor Coach, Allegheny County Steam Heating and Equitable Gas, Pittsburgh and West Virginia Gas—all head up in this venerable parent.

A gas well which George Westinghouse, of air-brake and electrical manufacturing fame, drilled in his back yard, caused the beginning of the system. There was so much of the gas that Mr. Westinghouse decided to sell it, and thereby entered the utility business. To do so he acquired a Pennsylvania legislative charter granted in 1871, permitting the holder to engage in almost every conceivable branch of business except banking. The charter, in the name of the Rio Grande Extension Company, came into the hands of some Philadelphia men on May 24, 1884, who on that day formed an organization under the name of the Philadelphia Company. This company, which was inactive, was taken over by George Westinghouse and his associates two months later.

Antecedents of some of the public utility companies in the present Philadelphia Company group were in operation in Pittsburgh before 1884. In the course of its development a large number of separate companies have passed through the processes of acquisition, organization and reorganization. There have been as many as 612 separate and distinct companies in the Philadelphia Company group, of which 289 were street railway companies, 249 electric companies and 47 gas companies. In addition, 107 other companies, predecessors of some of the original 612, were absorbed by mergers and consolidations before their successor companies became part of the system. The greatest number of active companies ever in operation at any one time was in 1916, when there were 322 companies composing the group.

In the year of its golden anniversary the number of subsidiaries and affiliates has been reduced to 73. Of these 55 are street railway companies, many of which are operated under lease. There are four natural gas companies, and one manufactured gas company (inactive); one oil company, two electric companies, one steam heating company, one railroad company, two coal companies, two motor coach companies, one automobile company, one real estate and one appliance sales company.

The Philadelphia Company group of companies has a background of technical pioneering and progress of historical moment. Equitable Gas Company claims credit for the first successful method of combining natural and manufactured gas and for the world's largest single day's send out of natural gas.

Much romance of successful business operation of Pittsburgh leaders is woven into the history of this organization. The first president of the company was Winthrop Smith, who served only two months, but he was followed by George Westinghouse, who served from 1884 to 1897. Then came James H. Reed, father of the present United States Senator David A. Reed, who served until 1919. He was followed by A. W. Thompson, who completed his term of office in 1926. A. W. Robertson, now chairman of the board of directors of the Westinghouse Electric and Manufacturing Company, followed until 1929, and was succeeded by John J. O'Brien, president of Standard Gas and Electric Company. Frank R. Phillips, incumbent, took office in 1931, following a long career in many branches of public utility operation.

Book Reviews

Public Utility Valuation. Reproduction Cost as a Basis for Depreciation and Rate-Base Determination. By Willard J. Graham. The University of Chicago Press. $1.00.

This new addition to the Studies in Business Administration series, published in connection with the Journal of Business of the University of Chicago, is of the greatest importance and interest to all public utility companies. It is undoubtedly one of the most complete surveys yet made of this perplexing problem. The author, assistant professor of accounting in the University of Chicago, has made a thorough study of the present basis for rate-base determination, and in this pamphlet presents his facts and his conclusions in a forthright, competent manner.

His expressed purpose is "to present an analysis of the relative advantages and disadvantages of the alternative bases and methods of 'valuation' for rate-making purposes, from as many points of view as possible, reflecting, in so far as possible, the probable effects of each method on the interests of investors and of consumers."

In the determination of a scale of service rates he believes two items to be particularly significant: (1) "Valuation" of the property items to be included in the rate base, and the determination of the total amount of the rate base; (2) Estimate of probable operating expenses, including depreciation, for the period involved. These he discusses in all their ramifications in the nine chapters of his book:

I. Rate-Base Determination.
II. The Investor Point of View.
III. The Consumer Point of View.
IV. Reproduction Costs Based on Index Numbers.
V. Depreciation Accounting.
VI. Accrued Depreciation.
VII. Bases of Depreciation.
VIII. General Considerations and Special Problems.
IX. Accounting Principles—Conclusions.

Professor Graham demonstrates that from the point of view of both public utility investors and consumer, the most equitable basis for the annual depreciation charge is current reproduction cost, and that the proper basis for rate-base determination is reproduction cost less the percentage of accrued depreciation that has been charged into the operating expense of prior periods. Utilities men will find particularly interesting Professor Graham's accounting treatment for the application of these principles, as set forth in his "model" accounting plan.

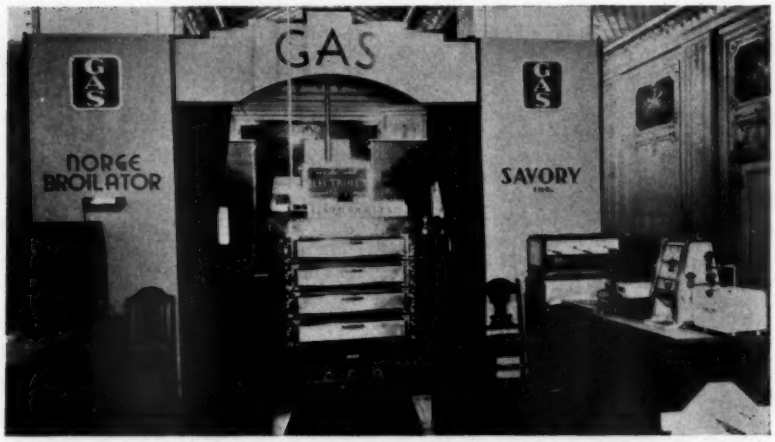
In conclusion, Professor Graham points out that up to the present time there are not a great number of commissions and court decisions to support depreciation charges based on current reproduction costs.

A TECHNICAL SIGNPOST

Headquarters has recently received, through the courtesy of the "Gas Journal," London, copy of "A Technical Signpost," a very conveniently arranged document, indexing under the headings most commonly used, technical matters contained in the "Gas Journal" during the year 1933. The index pages are followed by concise descriptive material, properly identified with regard to volume numbers and pages in the "Journal" volumes.

The availability of such a combined index—abstract makes infinitelv superior and far less time consuming the identification and location of specific material. For those who are required frequently to wade through the bound volumes and numerous indices, or even worse the weekly numbers awaiting binding, "A Technical Signpost" truly justifies its name. It is a very welcome beacon to the weary seeker. We predict it will be in constant use on our desk. —A. G. K.

Gas Appliances Displayed At Boston Hotel Show



A glimpse of part of gas exhibit at New England hotel exposition

WITH record-breaking attendance, the tenth annual Hotel Exposition, sponsored by the New England Hotel Association, was held at the Copley Plaza, Boston, Mass.

As a spectacle, it was by far the greatest show ever staged by the New England Hotel Association, and it would be extremely difficult to find a more enthusiastic group of exhibitors than those gathered together for this occasion. A large number of actual sales were reported, and many fine prospects which should later develop into sales were accumulated.

The space occupied by the gas appliance manufacturers was sponsored by the American Gas Association and the New England Gas Association, and was attractively decorated in a color scheme of two tones of green and silver.

Two pieces of equipment which were hitherto unknown to restaurant operators were shown for the first time. A timing device, applicable to deep fat fryers, by which the basket containing the fried food is automatically lifted from the cooking oil at a predetermined time, was displayed by the inventor, Charles F. Stoddard, of New York.

The Boston Consolidated Gas Company has developed an internally fired steam table which is heavily insulated and equipped with temperature control, as well as low water control, a working model of which was in operation for the benefit of visitors to the gas exhibit. This piece of equipment attracted a great deal of interest, not only among hotel and restaurant operators, but kitchen equipment manufacturers, as well.

Following is a list of the exhibitors:

Standard Gas Equipment Corporation, Detroit-Michigan Stove Company, G. S. Blodgett Company, Savory, Incorporated, General Equipment Corporation, Vortex Company, Yarnall-Waring Company and John Van Range Company.

W. S. Anderson, of the Boston Consolidated Gas Company, chairman of the Industrial Section of the New England Gas Association, was in charge of arrangements, assisted by Harry O. King and Roy E. Wright.

Finds Americans Fortunate With Abundant Gas

ON April 24 last, A. G. A. Headquarters reported a visit from Eugene Guman, technical director, Societate Nationala de Gaz Metan, Mediash, Rumania, en route to the gas fields and several large cities in the United States. Fifty-two days later, this most enthusiastic visitor called at Headquarters on the last leg of his trip.

During that time Mr. Guman visited many cities and gas companies, including Pittsburgh, Pa.; Charleston, W. Va.; Monroe and Shreveport, La.; Tulsa and Bartlesville, Okla.; Dallas, Houston and Galveston, Texas; Chicago, Ill., and the World's Fair; Cleveland, Ohio, and the A. G. A. Testing Laboratory. After a brief visit in New York City, Mr. Guman went to Niagara Falls and Buffalo and sailed for home June 23.

"The American people do not know how much more fortunate they are than most European countries which have nothing but coal and wood for fuel, and at the best manufactured gas which is too expensive for anything but lighting and cooking," Mr. Guman said.

Rumania is more fortunate than other countries because there are oil and gas reserves in and near this small nation. Mr. Guman pointed out, however, that such advanced appliances as automatic insulated ranges, gas refrigerators, and automatic water heaters were a grand luxury and beyond the means of the average Rumanian gas consumer.

It was with much surprise that the Rumanian engineer learned that gas air conditioning systems are within the reach of the average small home owner.

His company, The National Gas Company of Rumania, a privately owned firm, serves four cities in Transylvania. His native city, Medias, is one of the four. The pipe line serving this system is forty-five miles long and rock pressure, slightly more than 200 pounds, is used to transmit the gas to the consumer. A small compressor plant serves as reserve and is used only in emergencies.

Ninety-five per cent of all orifice meters used in Rumania and 90 per cent of the oil and gas compressors are bought in America. Pipe is purchased largely from Germany, but America gets 100 per cent of the drilling rig and a large share of the production accessory business.

The first Rumanian natural gas system was started in 1908. These plants are patterned largely after American systems and Mr. Guman came to America to learn the newest developments in natural gas properties.

The universality of automobiles in America were a constant source of wonder to this visitor. "Here a policeman's wife can have her own car; in Rumania, a policeman's wife cannot afford even a baby carriage," he expostulated.

A car that sells for around $600 in the United States would cost between $1600 and $1800, the price recently paid by the National Gas Company of Rumania which bought a new fleet.

Mr. Guman spoke with the kindest appreciation of the universal hospitality and warm welcome with which he was received everywhere he went. He frankly admitted that he could not possibly remember all the names of those he met but asked Headquarters to express his thanks to all.

Among the high lights of the trip, according to Mr. Guman, is the fact that his visit to Tulsa coincided with the International Petroleum Exposition, and that he was also a guest at the Rotary Club luncheon there at which representatives from many nations were present.

An airplane was placed at his disposal by one of the large natural gas companies and he was impressed by the trip by air over its fields. He commented upon the great technical progress apparent over conditions which prevailed when he visited the United States twenty years ago.

No definite figure as to the total mileage travelled was available, but Mr. Guman did remark that a two-thousand mile railroad ticket purchased in St. Louis was all gone when he arrived at Houston, Texas.

Large Helium Reserve Acquired By U. S.

THE acquirement of all gas rights in 50,000 acres comprising the Cliffside helium-bearing gas field, near Amarillo, Texas, has been completed by the United States Bureau of Mines, Department of the Interior. This field supplies the raw material from which all helium used by the Nation's military services is extracted in the Amarillo Helium Plant, designed, built and operated by the Bureau of Mines. In addition to supplying current requirements, the field provides a large reserve for future lighter-than-air craft operations of the Army and Navy.

When production and conservation of helium for Governmental use was delegated by Congress to the Bureau of Mines in 1925, the old supply was failing and extraction costs were high. From the World War period, when members of its staff suggested production of helium for aeronautical use to the Army and Navy and directed experimental work to develop processes for its extraction, the Bureau of Mines has continued its studies of helium. Through these studies the area now known as the Cliffside field was found to contain gas of about 1¾ per cent helium content.

With the responsibility of providing helium placed upon it by the Congress, the Bureau of Mines made a thorough study of the Cliffside field and considering all factors, determined that this field was the best reserve of helium-bearing gas then known. No comparable field has ever been discovered.

In 1927, the bureau contracted for leasehold gas rights in 20,000 acres as the initial step toward control of all gas rights in the closed geologic structure comprising the field. This contract was followed by a series of large purchases of both leasehold and lessor's retained rights. The last transaction covering about 9,000 acres, has just been completed, giving to the government all of the gas lease and gas royalty rights within this large helium reserve.

After the source of supply of raw material was selected, the bureau designed a helium plant of a new type and started its erection at Soncy, seven miles west of Amarillo, in August, 1928. The bureau also provided for the drilling of wells in the Cliffside field and construction of necessary pipe lines to bring the gas from the field to the plant.

Production of helium at the Amarillo plant was started in April, 1929. In five years of operation, this plant has produced more than 57,000,000 cu.ft. of helium, or about one-half of all of that element ever recovered in the world. Operating costs have been less than one-third of the lowest cost at which helium was ever obtained by the Government from any other source.

The Government's investment in helium plant, gas lands, wells, and pipe lines near Amarillo is about $2,100,000. Expenditures in operation over the five-year period have been $666,600, and $159,000 has been returned to the Treasury of the United States from sale of residue gas. Thus the net operating cost of producing 57,487,000 cu.ft. of helium has been only $507,624, or $8.83 per thousand cu.ft.

The lowest average cost over a year's period at which helium was ever obtained by the government from any other source was about $34 per thousand cu.ft. At that rate the 57,487,000 cu.ft. that has been produced by the Amarillo plant would have cost $1,954,558. The difference between that amount and the net operating cost at Amarillo is $1,447,134 or 71 per cent of the total investment.

The rock pressures of the wells indicate a depletion of the gas reserve to date of only about two per cent. The reasonable expectation is, therefore, that the entire investment will be returned at a time when the properties have served for only a very small percentage of their total useful life.

Broadcasts Value of A.G.A. Approval Seal

Miss Aubyn Chinn

THE value to women purchasers of the American Gas Association Laboratory seal was emphasized June 20 over a nation-wide radio hook-up by Miss Aubyn Chinn, chairman, Home Economics in Business Section, American Home Economics Association, and Director of Health Education, National Dairy Council, Chicago.

The occasion was an "advertising clinic" at the final session of the thirtieth annual convention of the Advertising Federation of America held at the Hotel Pennsylvania, New York, in which John B. Kennedy, writer and radio commentator, interviewed twelve outstanding merchandisers, advertisers and economists of the country on advertising and its relation to commerce, industry, and the consuming public.

Miss Chinn was the fourth speaker on the program. Mr. Kennedy questioned her on the importance of holding consumer confidence through honesty in advertising, and asked if she believed in the use of emblems or standards. Miss Chinn's reply was as follows:

"Very much so, Mr. Kennedy. The consumer is always glad to know any simple standard by which she can judge. And, even further than that, she likes to read in advertising the facts behind that standard. For instance, I am thinking of the American Gas Association. Their Committee on Standards has listed a number of fundamental points in the manufacture of a stove, which must be present if the standard seal of that industry is to be placed on that piece of equipment. This emblem represents the judgment of the best engineers in this field. The consumer knows she can trust their judgment. She likes to be told about this standard. One of the primary purposes of advertising, I should think, is the building of good-will and confidence. The consumer does not wish to buy with the feeling that unless she watches out for every item, she is going to be exploited or cheated."

Miss Chinn's statement was applauded by some 700 persons attending the session, a number of advertising men of public utility companies being present.

Interviewed at the close of the symposium, Miss Chinn said she had become greatly interested in the work of the American Gas Association Laboratory following her attendance and participation in the recent Chicago conference sponsored by the Home Service Committee of the American Gas Association. She said she was particularly interested in an address made on that occasion by R. B. Harper, vice-president of The Peoples Gas Light and Coke Company, Chicago, who spoke on "American Standards." Mr. Harper is chairman of the A. G. A. Approval Requirements Committee. Miss Chinn appeared on the same program, delivering a talk on "Low Cost Diets."

Amendment to Postal Laws and Regulations

(From United States Official Postal Guide Monthly Supplement, June, 1934)

May 25, 1934

Insert No. 85. Order No. 5492

Section 947, Postal Laws and Regulations, is amended by adding the following as paragraph 4:

Whoever shall knowingly or willfully deposit any mailable matter such as statements of accounts, circulars, sale bills, or other like matter, on which no postage has been paid, in any letter box established, approved, or accepted by the Postmaster General for the receipt or delivery of mail matter on any mail route with intent to avoid payment of lawful postage thereon; or shall willfully aid or assist in any of the aforementioned offenses, shall for every such offense be punished by a fine of not more than $300. (Act of May 7, 1934, Public, No. 209.)

Sales Experiences

Compiled by Sales Experience Committee, Industrial Gas Section

Industrial Installations Further Proof of Gas Efficiency

Spring Tonic

Did your mother ever feed you cream of tartar with molasses and sulfur as a spring tonic when you were a boy? If so, you may not have had much sympathy with the people who manufacture it, but perhaps when you learn that gas is the best fuel for this purpose, you may change your mind.

J. H. Gumz of the Pacific Gas & Electric Company reports the recent sale of natural gas to a large cream of tartar manufacturer in San Francisco. The sale was made on the basis of savings over oil at 89 cents per barrel plus $35 per car freight.

Three 130 H.P. boilers and sulfur retorts equipped with Forney combination oil and gas burners now show annual savings close to $5000 over the previous operating cost.

Influence of NRA

The influence of the NRA code on the textile industry makes it doubly desirable to reduce costs, and when operating, to run at the maximum capacity. However, it was not only the NRA, because in his report to the committee, L. H. Hungate, Jr., Industrial Gas Engineer of the Memphis Power & Light Company, says that "the NRA influence and six years of sales effort turned the trick."

Recognizing these factors, the American Finishing Company, at Memphis, has recently installed a Kemp industrial carburetor for supplying a closed cloth tenter. Increased speed in drying the cloth, together with perfect control of temperature, reduced operating costs very decidedly, and natural gas at 20 cents per MCF is successfully being used at the rate of 5000 cu.ft. per hour in this installation.

Formerly coal at $3 per ton delivered was fired under boilers, and the steam was used for drying the cloth. The steam cost was approximately 60 cents per thousand cubic feet.

Whipping Post

It is a strong boost for gas when a foundry superintendent says one would have to whip him if an attempt were made to take gas out in the Layne & Bowler plant at Memphis, Tenn.

J. S. Robison, of the Industrial Gas Division, Memphis Power & Light Company, states that originally this sale was based to a large extent on the fact that the use of gas for brass melting furnaces and for heating buildings in the same plant increased the total consumption so that the core baking installation described now earned a very much lower rate.

Once sold, however, the installation proved its merit by reason of the satisfaction obtained. Under thermostatic control and time clock shut-off, the baking of the cores is done at night, without any attendance, and in the morning the cores are properly baked with a very small amount of spoilage.

The installation consists of a Maxon Premix line burner in a direct fired core oven. A maximum of 600 cu.ft. of natural gas is used per hour, and at a rate of 26 cents per MCF, costs are considerably lower than coke at $7 a ton.

Gas vs. Steam

By cleverly designing a special drying room, consisting of individual compartments each of which is just large enough to hold one truck of wet rayon yarn, Stuart F. Morgan, superintendent of utilization of the New Bedford Gas & Edison Light Company, succeeded in selling gas in place of steam raised by oil boilers.

The original plan for rayon drying at the Edgar Weaving Company called for one large room heated by steam coils. With such an arrangement, gas could not compete with oil at 6 cents per gallon, but by substituting the compartment scheme, it was possible to dry each truck load, 6′ x 8′ x 4′, to just the proper moisture content by accurately timing the operation of a No. 125 Humphrey unit heater equipped with atmospheric burners. The arrangement provided is very flexible, and produces quick and reliable results and a superior product is obtained by gas.

It is interesting to note in this connection that the special design provided added somewhat to the original cost of the installation, bringing it just about up to the amount projected by using oil. However, no chimney was required, and a great deal more flexible and speedier operation was obtained by the use of gas.

The maximum hourly consumption is estimated to be 125,000 B.t.u., and gas is available at 76 cents per MCF (540 B.t.u. gas).

Lower Insurance

An unusual installation was made last winter by C. W. Gale, superintendent of the Industrial Gas Division, Public Service Co. of Colorado, which opens up a remunerative although not very large field for gas sales.

Recognizing that the depression has caused many commercial buildings to be vacant, with subsequent high fire insurance rate and undue depreciation, Mr. Gale has installed gas designed boilers for low pressure steam and water heating in a number of vacant commercial buildings whose regular large heating boilers are not kept in service. The small gas designed boiler will prevent undue depreciation of the property by keeping downspouts free of ice and by preventing freezing of the reserve fire protection storage tank located on the roof of the building, will keep low insurance rates operative.

The usual installation of this size in commercial buildings will not take more than 200 cu.ft. of natural gas per maximum hour, and at a rate of 50 cents per MCF this competes very successfully against coal at $4.25 per ton plus fireman, labor, etc. Furthermore, the certainty of automatic gas heating is very important in work of this kind where careless operation in a vacant building might be disasterous.

Smoke

"We feel," writes E. D. Gornto, industrial gas engineer of the Virginia Electric & Power Company, "that our low installation cost did a great deal in securing the business of the Cudahy Packing Company here in Norfolk."

The Cudahy company has recently selected two cities in the East for experimental use of gas for meat smoking in place of hard wood, formerly used exclusively. The cost of the original installation was the deciding factor in selecting Norfolk and Atlantic City, since the installation of gas equipment was respectively $75 and

free in these two communities. In one eastern city the gas company wanted approximately $650 to make the conversion from wood to gas firing.

Straight atmospheric pipe burners are used, having a maximum hourly consumption of about 250 cu.ft. of 530 B.t.u. gas per hour, at an average cost of 70 to 80 cents per MCF. The results obtained in Norfolk are very satisfactory, and other smoke houses are expected to be converted shortly. Approximately 1 cu.ft. of gas per pound of smoked ham was the average result obtained.

Another Cudahy Job

That gas was successful in the Cudahy Packing Company plant at Norfolk is evident, for now another installation has been made, this time in their Braddock, Pennsylvania, plant.

H. Dangerfield, industrial gas salesman of the Equitable Gas Company, reports that natural gas at 50 cents per MCF (1130 B.t.u. per cu.ft.) has replaced hard wood for meat smoking. The advantage of better temperature control of gas heat resulted in a very much better smoked product. An annual consumption of 728 million B.t.u. is expected from this installation, using drilled pipe burners with Partlow temperature controls in three-story brick smoke houses.

Power

According to C. A. Breitung of the MacThwaite Oil & Gas Company, Ada, Oklahoma, the gas engine installation at the Ada Independent Ice Company will pay for itself in less than two years.

The approximate operating cost of a Bruce-Macbeth 60 H.P. engine with natural gas at 18 cents per MCF will be one-quarter as much as that of running an electric motor at 5½ cents per KWH. Representatives of the Bruce-Macbeth Engine Company demonstrated the stability of operation of the gas engine, and at this low rate for natural gas the owners of the Ada Independent Ice Company will be able to pay for the installation cost of the gas engine and the amortization of the electric motor in less than two years.

The gas engine should ultimately form a splendid outlet for additional industrial sales.

Refinement

When a new gas furnace replaced the oil fired heat treating equipment at the Atlas Ball Company, Philadelphia, the results fully justified the expense of the new equipment. Even though No. 3 oil was available at 4 cents per gallon, the refinement of results, reduction in scale, and the advantage of accurate temperature control and cleanliness in the plant more than offset this low oil price.

The new gas furnace, designed for a maximum of 1200 cu.ft. of 530 B.t.u. gas per hour, has a single valve control, and according to F. H. Trembly, Jr., supervisor of the Industrial Division, Philadelphia Gas Works Company, is proving very satisfactory indeed. The gas rate is 75 cents per MCF.

Effect of TVA Publicity

One of the most successful gas galvanizing installations is reported by O. F. Reynolds, industrial engineer of Chattanooga Gas Company, where some years ago 520 B.t.u. gas replaced coke, obtaining better control, less dross and better working conditions.

This 30-ton pot, equipped with Surface Combustion high pressure velocity burners, used a maximum of 1,248,000 B.t.u. per hour, and with gas at 75 cents per MCF, competitive fuels such as oil at 5 cents a gallon, coke at $4.50 a ton, and especially electricity at 1 cent per KWH, were successfully kept out.

Now this plant has installed a trial electric pot. Although the representatives of the electric company claim lower cost and lower stand-by expense, there is some reason to believe that work of the TVA in relation to the lower electric costs is an important influence in the customer's mind. It has also been alleged that the electric company is waiving the demand charge in order to get this business, because the electric rate is the same as it has been for years.

"Let 'Em Eat Cake"

When the bakery at Goldie Conway, Denver, Colorado, thought about new ovens, they naturally turned to C. W. Gale, superintendent of the Industrial Gas Division of the Public Service Company of Colorado, for help. Now a Roberts bake oven is proving satisfactory in every particular, both as to cost of operation and quality of the cake baking.

Denver has natural gas of about 830 B.t.u., which is a specially attractive fuel for baking, particularly in competition with electricity available in this bakery at 4 cents per kilowatt hour.

The oven is thermostatically controlled, insulated with rock wool, has porcelain enamel on the exterior, and is so arranged that either deck can be thermostatically controlled independent of the temperature of the other deck. This type of oven was chosen to compete with a very expensive electric oven, and consequently the customer has been very much impressed with the low operating cost and the cool bakery which has resulted from the use of this oven. It was found particularly advantageous for the baking of fine cakes. Gas is available at 75 cents per M cu.ft.

Guaranteed

By this time there probably isn't anyone connected with the gas industry who does not know that many newspapers are all-gas jobs. But in this field, as anywhere else, there is a constant change and new things are tried and the old discarded. Naturally enough, newspapers have investigated competitive fuels, such as oil for stereotype melting.

When J. H. Doak, industrial gas engineer of The Connecticut Light and Power Company, suggested gas, the *Morning Record* at Meriden said, "O.K., if you can guarantee your claims." This job was on gas originally, but would have been lost to oil unless the savings could be guaranteed.

Promptly the equipment was changed over from the original underfied arrangement to an immersion type of unit. Two Hoe pots of 3600 and 5000 lbs. capacity respectively were changed over to immersion melting, with a very remarkable saving in fuel. Originally 715 B.t.u. were required for every pound of stereotype plates cast, but after the new units were installed the gas consumption was reduced to 238 B.t.u. to the pound of metal.

Not only was there a saving in gas, but there was a considerable increase in the uniformity of plates cast; the dross was reduced one-third, presumably due to more uniform heat application; and local hot spots were eliminated. In addition to this, melting proceeded faster and cooling took place much slower than before. Since the heat was now entirely confined within the metal and the outside of the pot insulated, the working conditions in the melting room were made more comfortable, a feature which undoubtedly will be appreciated more and more as the summer approaches.

With gas at 95.2 cents per M. cu.ft. of 520 B.t.u. gas, this installation is representative of the real improvements that can be effected, even in relatively small jobs, by proper application of modern equipment and controls.

Mare Island Navy Yard Satisfied

Although this sales experience only describes the recent installation of fifteen brass, copper and monel crucible melting furnaces, estimated to use three million cubic feet of gas per year, the Mare Island Navy Yard also has core ovens, heat treating furnaces, rivet heaters, two galvanizing kettles, one tinning kettle and many miscellaneous operations on gas.

General satisfaction with this large number of gas installations, and especially with these Surface Combustion crucible furnaces, helped to replace the old oil-fired units. Considerable trouble with the oil burner, and the better control of atmosphere possible by the use of gas, were also of importance in making this sale.

With an actual maximum hourly consumption of 22,000 cu.ft. of natural gas for the fifteen melting furnaces, a rate of 30 cents per MCF is more than competitive with oil at 54 cents per barrel under the Navy contracts.

ACCOUNTING SECTION

E. B. NUTT, Chairman H. W. HARTMAN, Secretary A. S. CORSON, Vice-Chairman

Accounting Committees Make Progress

THE months of April, May and June are among the busiest of the year for all Association committees, and this has proven no exception in the Accounting Section.

Earlier months are taken up with adoption of committee programs, assignment of definite tasks to subcommittees with all the enthusiasms and optimisms that characterize beginnings.

The real results and work involved come out at the final meetings, and the Accounting committees that have met recently have not only splendidly fulfilled the promise at their organization, but have shown an infinite capacity for work.

Customer Accounting Committee held its final meeting at the Penn Athletic Club, Philadelphia, Pa., on April 23. Three subcommittee reports—"Control of Customer Accounting Procedures," "Consumers Deposits" and "Cash Receiving Procedures" were discussed and definite decision reached as to the final draft. There was every indication that reports would be completed and passed on to the Editorial Committee at an early date.

On May 3 and 4 Accounting Machines Committee met in the offices of the Public Service Electric & Gas Company at Newark, N. J. The committee viewed demonstrations of recent developments given by representatives of Felt & Tarrant Manufacturing Co., National Cash Register Co., Remington-Rand, Inc., and International Business Machine Co. Later the committee reviewed the reports of the subcommittees on "Billing Machine Developments," "Photo Strip Accounting" and "Wrinkles." These reports were well along toward completion and present information which will be of definite value to members of the Association.

Office Management Committee held its final meeting at Association headquarters on May 28. The meeting was devoted to discussing and bringing into final form subcommittee reports on "Wage Incentives for Collectors" and "Filing Systems": (a) "Centralized Filing," (b) "Corporate Filing." Report on "Wage Incentives for Collectors," while primarily based on the successful application of the system by one of the larger companies, will, it is believed, be extremely interesting to companies which, for one reason or another, have discontinued wage incentive plans. The report on "Filing Systems" will also contain much valuable information on problems which all companies face.

Also on May 28 the General Accounting Committee held its final meeting in Hotel Statler, St. Louis, Mo. The subcommittees on "Coding Systems for Accounts" and on "Transmission and Distribution Accounts (Comparative Practices)" submitted their reports for discussion and revision. The report on "Transmission and Distribution Accounts" does not attempt to present a uniform accounting method but will be confined to presentation of data from essential information obtained by the committee pertaining to the set-up of five different companies in the industry. This report will be of particular value to many members of the Association. Report on "Coding Systems for Accounts" covers a subject not heretofore included in Accounting Section activities and will prove helpful to those interested in this branch of accounting.

The Customer Relations Committee has handled most of its work through correspondence. The three subcommittee reports are now in complete form, and are of particular interest from the customer relations angle.

On June 2 the final meetings of the Managing and Advisory Committees of the Section were held in the Ritz Carlton Hotel, Atlantic City, N. J., and the attendance was gratifying. The committee chairmen reported in detail on the activities of their respective committees, indicating that final reports would be in the hands of the Editorial Committee sufficiently early to permit distribution of printed reports to Accounting Section members well in advance of the convention. A tentative program and time log for the convention sessions was presented and after full discussion the final program was worked out.

In addition to the Committee Reports, the program will include two outstanding addresses on accounting subjects, one by a prominent accountant within the industry and the other by a national figure outside of the industry. The plans with respect to the series of luncheon conferences, which is a new activity of the Section this year, were discussed and approved. It is confidently expected that these conferences will prove popular and be particularly helpful to those who attend and take part in the informal discussions of timely subjects.

Chairman Curren, of the Exhibit Committee, reported that sufficient exhibitors had already signed up to insure an exhibit of accounting machines and equipment of unusual interest at the convention.

On motion, made and seconded, the following resolution was passed, and a suitably engrossed copy thereof was forwarded to Mrs. William A. Sauer:

"On Saturday, February 24, 1934, there passed from the scenes of his distinguished labors, William Albert Sauer, a charter member of the American Gas Association, and a former chairman of its Accounting Section.

"As chairman, his technical knowledge, rare business ability and impressive practical experience, combined with his high ideals, commanded the respect and admiration of his fellow members. His loyalty and devotion to our industry and the Accounting Section, and his contributions in their behalf, were outstanding and deserving of the highest commendation.

"As a friend, the memory of his genial personality, his spirit of helpfulness, and his good fellowship will bring the warmest personal recollections to the hearts of all who were privileged to be closely associated with him.

"With a profound sense of personal grief at his passing, the Managing Committee, as a tribute of respect to his memory, enters this memorial on its minutes and orders that a copy suitably engrossed be sent to the family of Mr. Sauer as an expression of deep sympathy in their loss.

MEMORIAL COMMITTEE

(Signed) EDWARD PORTER
J. I. BLANCHFIELD
H. M. BRUNDAGE
J. L. CONOVER
J. M. ROBERTS
E. B. NUTT, *Chairman,*
Accounting Section."

MR. LEUDEMANN PROMOTED

A. V. Leudemann, for twelve years in charge of the metropolitan New York area for Mears-Kane-Ofeldt, Inc., has been appointed general sales manager of that company. He will retain his present office in New York. Mr. Leudemann was formerly connected with the utilization department of the Consolidated Gas Company of New York.

Job Training for Meter Readers, Collectors, and Bill Deliverers*

By GEO. W. FUCHS
Philadelphia Electric Company

JOB-TRAINING courses have as their goal improved public relations and decreased operating expense. Any course applied to meter readers, collectors, and bill deliverers must be directed so that great emphasis is placed on the public relations angle; the decreased cost feature being of secondary importance. No course, however well planned, can have a good measure of success unless the men are sold on the company, otherwise much of the time and care devoted to giving a job training course is wasted.

While job-training courses are desirable in any company they are particularly necessary in a company operating on a decentralized plan because the forces operating out of several offices of the same company are apt to develop their own interpretations of the company's policies and practices. These interpretations may be quite different in the several offices. The course, therefore, facilitates standardization both in policies and in practices.

Result Obtained

One company which conducted such a course obtained marked improvement in public relations, as evidenced by complimentary letters written to newspapers and to the company's offices, as well as the favorable remarks made by customers directly to the men. In addition, practically no complaints have been received regarding poor conduct exhibited by the men. The latter even applies to collectors who frequently meet customers under extremely adverse conditions.

In most large companies numerous printed forms are required to report various conditions. Each form must follow a fixed routine if confusion is to be avoided. In preparing the material for the course, it was necessary to define each form, to explain how it is to be filled out, and the channels through which it must pass. This brought to light forms and practices which were ignored by some offices, and also possibilities for more efficient handling of the work. Several forms were consolidated and a single form substituted to provide satisfactorily for all conditions. Both the management and the men benefited by the simplicity of the forms and routines which were ultimately made effective.

Many companies are probably under the impression that their forms have been carefully reviewed and the routine which they follow is ideal. It was surprising, however, to the company that prepared the job-training course, the number of changes which could be made to permit greater effectiveness and lower cost.

The course also facilitated the interchangeability of men between the bill delivery, meter reading, and collection forces. All men of these grades received identical instructions and only a small amount of field experience is necessary for some men to qualify for the next better position. In fact, the training course lessons and materials serve as a manual governing the work of each group. A new employee must carefully study the lessons pertaining to his work before being permitted to contact customers.

As a result of the instructions, meter readers discovered cases where meters were tampered with in order to prevent their properly registering the flow of gas.

Organization of the Course

The head of the customer's accounting department and his staff, assisted by a professor of industrial research from a near-by university, supervised and directed the course from its inception to completion. These men designated the lessons and the subjects to be covered and delegated the work of preparing the various lessons to the department head most familiar with the subject matter.

Each lesson, when completed in the preliminary form, was referred to the head of the customer's accounting department and his staff for review and criticism. The criticism took into consideration company policies and practices, and clarity of expression, making certain that words were simplified as far as possible. A lesson outline, quiz questions, case problems and answers to problems were prepared by the staff.

The lesson outline, as the term implies, is a brief outline of the subject covered by each lesson and was used as a guide to be followed by each employee during the progress of the lecture given by the class leader.

Quiz questions consisted of ten written questions to be answered by the members of the class in order to determine whether the lesson had been thoroughly studied. A typical question is given below:

"The capacity of gas meters was originally designated in terms of . . . . but is now more correctly designated in terms of . . . . per hour."

The employees supplied the proper term for the blank spaces, in this case "light 3, 5, etc.," and "cubic feet." All answers were written. Ten minutes of each lesson was devoted to answering questions. Each employee was given a grade for the quiz. These grades were posted to excite competition and interest and served their purpose well.

A case problem is a typical inquiry made by a customer or a common complaint made by customers regarding the department or its work under study in the lesson. The case problem concerns itself with fortifying the employee with the facts in the case and the proper answer which should be given the customer.

Formation of Classes

The company which gave this course operates on a decentralized customers' accounting plan and classes were conducted in each of the several offices. Classes were, therefore, organized in each office consisting of not more than twenty men with a class leader and an alternate; the larger offices requiring two classes. Care was exercised in placing a number of men from all three departments in each class so as to obtain diversity of opinions, practices, and experiences. The class leaders and alternates were selected from the capable supervisors in each office and the selection was made by the staff.

All classes were carefully scheduled so as not to interfere with regular work. Two weeks were allowed between lessons. Most classes were held between 3 and 5 p.m., and a few were scheduled for Saturday mornings. A room which would normally be vacant during these hours was selected for the holding of the classes. Each room was equipped with chairs and a blackboard. All lesson material was prepared in mimeographed form. The men were equipped with loose-leaf binders in order to keep the material in permanent form.

Method of Conducting Course

Because of the large amount of demonstration material required, Lessons 1 and 2 were held at a central point. Representatives of the meter department conducted these classes.

Lesson 3 was the first to be given by the designated class leaders and alternates. During the first and third week of each month all leaders and alternates attended a group meeting at the central office for the purpose of receiving instructions and criticising the lesson material, quiz questions and case problems. Prior to each meeting, each leader and alternate received a copy of all lesson material. The professor and accounting department staff conducted these meetings. Intense interest was exhibited by those in attendance.

Because of the numerous changes recommended by the leaders and alternates, only a limited number of the first draft of the lessons were prepared. The criticisms were primarily encouraged to pro-

* Contribution of the Customer Accounting Committee.

duce a clear and readily understandable lesson. After these meetings, the lessons were prepared in final form and a supply sent to each class leader.

Prior to the class meeting in each office, the leader gave a copy of the lesson outline to each member of the class. The outline was studied at home by each employee and then brought to his next regular class session. At the start of the class for Lesson 3, the quiz questions pertaining to Lesson 2 were given out to the class and ten minutes were allowed for answering the questions. A short time was next allowed for a brief review and the answering of any questions pertaining to Lesson 2. This part of the class session consumed about twenty minutes.

Upon completion of this preliminary discussion, the leader or his alternate followed in lecture form the outline of Lesson 3, going over all points in detail. Next in order, the case problems pertaining to Lesson 3 were covered. The leader or alternate read the problem and then asked members of the class for an answer. A typical case problem is as follows:

"You call at the residence of Mr. Smith to read the gas meters. You find that a new gas meter has been installed and its record has been entered on a yellow sheet. This meter is an additional meter, and you observe that it supplies a newly installed gas house heater.

(a) Has the proper record been made in your meter reading binder?
(b) If not, state what should have been the correct record.
(c) What action should you take in this case?"

The answers provoked much discussion, and after many good answers were given the leader or alternate gave a brief summary of the complete answer.

At the close of the session, each member was given a mimeographed copy of Lesson 3 with the case problems and their answers. These had to be studied during the succeeding two weeks in order to answer properly the quiz questions given out at the beginning of the session on Lesson 4.

Lessons and Subjects Covered by the Course

Lesson 1—Operation of Meters; definition of terms, principle of operation of meters, meter serial number designations, installation requirements for meters, method of testing meters and test schedules, gradual-cease tests.

Lesson 2—Mechanics of Meter Reading; types of meters to be read, attaching and pressing seals, shutting off service, illegal methods of obtaining gas not registered on meter.

Lesson 3—Meter Reading Forms and Their Use; purpose of forms, importance of neat and legible reports, notice to indexers, meter reading sheet, missed reading record, complaint report, meter reading card, meter reader's daily report, operator's report of condition of vehicle, checking of occupied houses where records show that service is off and meter does not show registration.

Lesson 4—Order of Reading Meters and Delivering Bills; territory supplied, number of meters and customers, territorial subdivisions, meter reading routes, trips and folios, reading schedule, filing of reading sheets in meter binders, reading order, bonus plan, meter reading clerk and routine of handling binders, regulations concerning restricted uses of mail boxes, inquiries made by customers, collections by bill deliverers.

Lesson 5, Part I—Appearance and Deportment; meter readers' uniform regulations, health as a factor in deportment, dress and appearance, deportment while on the job, courtesy to fellow employees, deportment while driving automobiles, reporting damage to customer's property, personal injury.

Lesson 5, Part II—Handling General Inquiries from Customers; information necessary in order to deal with customers' inquiries, principles in conducting conversations with customers; *a.* do not interrupt, *b.* do not contradict a customer, *c.* do not criticize or give orders, *d.* do not use technical terms, *e.* be definite, *f.* courtesy above all.

Lesson 6—Credit Policy and Procedure; credit as applied to this company, acceptance of applications for service, deposit policy, relation of collection of deposits and arrears to the credit policy, merchandise sales credit policy, securing the necessary credit information, proper preparation of leases, granting credit under present conditions.

Lesson 7—Policies and Procedure in Bill Collection; policy in general, customer's credit history, delayed payment charge, contact with customers, reconnection charges, discontinuing service for non-payment, delinquent merchandise accounts.

Lesson 8—Responsibilities of Collectors; the position, qualifications, the collector's responsibilities.

Lesson 9—Collection Forms and Their Use; purpose of forms, notice of overdue account, notice of merchandise account due, statement forms (gas, merchandise, and coke), collectors' call cards, collector's daily report, collector's report on delinquent merchandise accounts, collector's equipment, care of equipment.

Interesting Points Discovered

The age of the men had little if any effect upon their ability to absorb the material presented.

The time devoted to teaching men how to read dials at or near the zero positions was profitably spent.

The posting of class averages in all offices aroused a spirit of competition and reacted very favorably in creating even greater interest in the course.

Many men did not know the names of parts of the meters and connections, and in the past had given misleading information when reporting the trouble.

Lesson material is highly prized and the men are reluctant to surrender copies of any lesson when a temporary shortage exists.

Charles R. Prichard Dies in Massachusetts

CHARLES R. PRICHARD, vice-president and general manager of the Lynn Gas & Electric Co., died at Beverly Hospital, Beverly, Mass., June 25 at the age of fifty years. He had occupied his position with the Lynn Company since April 1, 1925. He was the son of the late Charles F. Prichard who held the same position for many years.

Mr. Prichard was born in Lynn and received his early education there. He was graduated from the Massachusetts Institute of Technology and in 1905 became treasurer and manager of the Beverly Gas and Electric Co., remaining there for about fifteen years. In 1921 he was appointed vice-president and general manager of the Lowell Gas Light Co., and was there for four years until accepting the same position at Lynn.

Always active in the gas industry's affairs, Mr. Prichard was a director of the New England Association of Gas Engineers and secretary of the Guild of Gas Managers. At the time of his death he was a member of the advisory council of the American Gas Association. He was also a director of the Gloucester Electric Company, Salem Gas Company, and Citizens Gas & Electric Company, Nantucket.

Russian Engineers Inspect Coke Oven Gas Manufacture

A. G. A. HEADQUARTERS and the Hunts Point plant of the Consolidated Gas Company of New York were visited last month by A. M. Turetsky, chemical engineer and vice-president of the All-Union Coke Trust of the U. S. S. R.; A. K. Shelkoff, chemical engineer and chief engineer of Coke Oven Plants at Dnepropetrovsk; A. S. Zack, chemical engineer and technical director of Coke Chemical Combine of Gorlovko; P. M. Kopelevick, director, and D. G. Amol, engineer of Coal Research Institute; and Miss N. Mallen, chemical engineer and assistant representative of the Chemical Industries of the U. S. S. R.

They are inspecting American coke oven gas manufacture, high pressure distribution, and problems incident to distribution at extremely low temperatures.

COMMERCIAL SECTION

Employee Industry Development Plans*

By A. A. SWEENEY

New England Power Engineering & Service Corporation

THE importance of aggressively promoting the gas business is so apparent that it is unnecessary to spend any time outlining reasons for using every possible means of defense and offense to maintain and increase the gas load.

After more than 100 years of reliable service the industry during the past four years found itself faced with competition from other forms of fuel which could not be ignored. Ever since Franklin experimented in the rain with his kite and key, down to the modern radio, electricity has thrilled the imagination and the glamour of the achievements in the development of this magic force has helped to promote its acceptance as a necessary modern service.

Economies and retrenchments incidental to the recent years of business depression materially strengthened the position of equipment using oil, whose chief claim to popularity was that "it's cheapness recommends it."

The gas industry has competition which must be met with positive action if it is to stop the tendency towards the replacement of gas appliances with equipment using these other fuels, and the public must be educated in the possibilities of the service to encourage a more complete and satisfactory use of gas appliances.

Enough for the problem—now what can be done about it? Late in 1933 the retail gas companies affiliated with the New England Power Association, recognizing that improvements in business conditions were not going to guarantee the restoration of lost load, initiated a gas sales program. At a meeting in October the officials of these companies discussed the problem and suggested methods of improvement. The consensus of opinion at this meeting stressed the absolute necessity of securing the unqualified cooperation and support of the employees. A committee was appointed to develop these suggestions into a program of industrial development, and the next three months were devoted to a careful consideration of all phases of the situation. Particular attention was given this matter of employee participation, and the final plan contemplated every gas company employee as a working partner in the program.

Gas Sales Program

In January of this year a second meeting of the officials considered the proposed program, which was approved, and the committee was instructed to introduce our "Gas Sales Program" to the retail company organization. The presentations were made at ten evening dinner meetings, attended by 1,350 of our employees, in the form of a conference of the committee, with a discussion of each problem and the adoption of recommendations as to methods of procedure with regard to each problem.

Our Gas Sales Program recognized four major objectives: 1, Holding the Present Load; 2, Restoring Lost Customers; 3, Increasing Customer Consumption, and 4, Developing New Business.

Each of these objectives was analyzed and a definite schedule of activities established for the successful accomplishment of the objective.

To hold the present load it was recommended that every company establish customer satisfaction by means of an educational campaign, including a program of employee information, planned schedules of demonstrations, and the replacement of outmoded appliances in educational institutions; that employees be encouraged to make increased use of modern gas appliances; that plant improvement be effected by the development of standards for plant and operating routine; that service be improved by the development of standards for service and inspection; that all removal orders be investigated by company managers; that all company managers analyze their rate structures and make recommendations for revisions designed to obtain new load; that the services of an advertising agency be retained; and that an award system be instituted for recognizing improvements in all departments.

Still considering this subject of holding the present load, it was further recommended that an intensive study be made of the competition presented by other fuels, with an analysis of costs of competitive fuels; surveys of present use of these fuels by our customers; and surveys of dealers supplying both gas and competitive fuel equipment.

The final recommendations for holding the present load involved merchandising plans, requiring sales managers to analyze their territories as to the sales force required to make proper contacts; the adoption of an employee prospect lead system, with bonus for leads which the salesmen developed into sales; the classification of customers as to their ability to make increased use of the service, and the adoption of an aggressive policy of replacing all outmoded equipment.

Restoring Lost Customers

The second objective of restoring lost customers was divided into two classes, first, consideration of customers discontinued because of nonpayment. It was recommended that such customer be surveyed and where possible reconnected on a weekly collection basis, using installment prepayment meters where necessary. The second class included all meters discontinued for any reason other than nonpayment and recommendations were made for the survey and reconnection of these meters, using weekly collection and installment prepayment meters. Under both classes a bonus system was recommended for employees obtaining reconnection during periodic activities.

The third objective of increasing customer consumption was divided into four main classes. The first, promoting the complete use of gas, recommended the installation of modern kitchens and removal of all auxiliary equipment using other fuels; the installation of modern display kitchens in all our stores, and a schedule of publicity and demonstrations in store kitchens.

The second class, the development of additional uses, recommended the aggressive promotion and sale of modern automatic gas ranges; cooperative dealer and utility display; enrollment of employees in American Gas Association educational courses; demonstration service for both dealer and utility sales; restriction of utility refrigeration sales in gas territories to gas refrigerators; development of qualified water heating sales forces; inspection and adjustment of gas water heaters; the selling of quality water heating service designed to fit the individual customer's requirements; a definite promotion of space heating; promotion of air conditioning in connection with house heating; coordination of kitchen displays with dealer and utility sales activities; special emphasis on such improvements as the speed burner; consideration of traveling kitchens for rural territories; definite sales schedules with coordinated advertising; and an intensive use of monthly bill enclosures and direct mail coordinated with the sales schedule.

The third class, cooperation, recommended the encouragement of dealer participation in the sale of high-grade standard gas appliances; merchandising on a basis which allowed of profitable dealer

* Address before New York-New England Regional Gas Sales Conference, New London, Conn., June 29, 1934.

participation; and the making available to dealers of utility demonstration, display and educational facilities; contact with builders and architects to promote the use of gas equipment in the design and redesign of homes; the use of direct mail to promote all-gas modernization; and a planned schedule of promotional publicity addressed to builders and architects.

The fourth and final class, analysis, recommended the adoption of load-building budgets to establish required replacement, with allocation of advertising, publicity, sales expense, sales effort and seasonal application.

Developing New Business

The fourth objective, developing new business, established four divisions. The first, publicity, recommended the constant presentation of gas as a modern fuel; that local publicity to new gas developments be given in newspapers; publicizing employees' homes regarding new developments in the industry; and the scheduling of local talks and plant inspection trips for community groups.

The second division, heating, recommended the development of the modified use of gas for heating where complete installations could not be effected; the training of salesmen of house heating; particular attention to the servicing of present installations; and the analysis of all removal orders by the company manager.

The third division, water heating, included recommendations for the publicizing of new developments; the training of salesmen; and the replacement of outmoded or otherwise unsatisfactory equipment.

The fourth and last division contained recommendations for the use of all new developments by manufacturers; the establishment of local ordinances; revision of outmoded regulations; and finally that gas always be positively presented as a permanent modern service.

These sixty specific recommendations, with their explanatory analyses, were printed and published as the Gas Sales Program. Local committees were appointed for the development of the program in each company and these committees furnished copies of the program and assigned the task of conducting monthly meetings for the purpose of employee education as to company policies and plans, information as to progress of the program, and the organization of employee cooperative movements. We organized a central information bureau in our Boston office to compile and distribute material for use at these meetings, and this bureau issues a monthly bulletin containing reports of all company meetings and plans for the succeeding month's activities. This bureau also publishes material for an employees' manual which is used at the company meetings for educational purposes. Approximately 2,800 copies of this manual, which is printed in the conventional Lefax pocket size, are distributed at regular intervals.

Type of Material

The following index will serve to illustrate the type of material contained in the manual:

A.—General Information (For all Employees)—Company policies, sales policies, sales and advertising schedules, customer contacts, vital company statistics, interesting information about the gas industry, improvement award system, competing fuel costs, gas service rates, standardized list of appliances and consumption of appliances.

B.—Special Sections (for Departments)—Sales Department, schedule of demonstrations, standard sales terms, local ordinances, dealer cooperation.

Service Department, Trouble call procedure, plant and operating standards, inspection routine.

Unclassified Customer Contacting Employees, meter readers, accounting department, plant departments.

A complete system of reports was instituted and in the three months ending May 31 thirty-eight meetings have been held in local companies, with an attendance of 1,950 employees. In addition to these regular meetings, groups have met for the purpose of considering certain specific problems. For instance, service men have held meetings at which manufacturers' representatives have instructed them in the servicing of their products; distribution departments have considered operating and safety problems; office forces have met to consider the application of the program to their routine; and sales departments have included consideration of the program in their regular meetings; while plant departments have arranged inspection trips for local groups.

At the present time we are developing a progress chart for the purpose of recording each company's program activities.

At this point let me give you a brief picture of our organization and territory so that what I say about the results achieved may be properly evaluated.

The twenty-eight retail gas companies affiliated with the New England Power Association serve 265,000 domestic gas customers, and operate in Vermont, Massachusetts, Rhode Island and in a small territory in Connecticut. There are approximately 3,000 employees engaged in the operation of these companies, and merchandising operations are conducted in sixty-seven stores and by means of outside salesmen. Every company actively cooperates with dealers in sales activities, and we make a practice of referring to the dealers in all our newspaper and direct mail advertising. Our advertising is prepared by an advertising agency and distributed from our Boston office.

Now, as to the measured results accomplished by the Gas Sales Program: During the four months in which the program had been in effect ending May 31, merchandise dollar sales increased 90 per cent over the same period in 1933, and the estimated increased use of gas resulting from merchandise sales increased 52 per cent. Modern automatic gas range sales increased 30 per cent, gas refrigerator sales increased 161 per cent, and storage water heater sales 50 per cent.

It will be remembered that one of the recommendations called for the analysis of rates. As a result of a careful analysis of all gas rates, several of our companies have recently announced new house heating rates, and at the present time we are working on the survey of over 1,000 prospects. At the end of May our house heating sales already showed an increase of 600 per cent over last year. Non-selling employees have turned in a total of 2,462 prospect leads, resulting in 409 actual sales. These leads are classified as follows:

Appliance	*Leads*	*Sales*
Modern automatic ranges	786	152
Refrigerators	880	139
Automatic water heaters	395	79
House heating	364	35
Miscellaneous	37	4

We recognize that this Gas Sales Program is neither new nor original. Many of the ideas incorporated in this plan were already being used in some of our companies and many more were contemplated and only needed the stimulus of a coordinated plan for their active development. We have secured the enthusiastic support and cooperation of every member of our organization, and the success of the program leads us to believe that it will result in a new and greater development of our gas business.

From the Land Of the Rising Sun

Through the kindness of Mr. C. Mizukoshi, general manager of the Imperial Gas Association of Japan, Headquarters has been privileged to receive visits from Kiyoto Otsubo and Yoshiaki Kogane.

Mr. Otsubo is superintendent of the research department and engineer of South Manchuria Gas Company, Ltd. of Dairen, Manchuria, and is looking into matters connected with many branches of the gas industry. He has visited the offices and plants of many larger gas company and manufacturer members including the Testing Laboratory, at Cleveland.

Mr. Kogane, a lawyer, is secretary of the Ministry of Commerce and Industry and director of the Bureau of Supervision of Gas Industries of the Japanese Government. Mr. Kogane, on behalf of the Japanese Government, is making a tour throughout the world and has already spent some time in the United States. He leaves shortly for Canada, thence to England and the continent of Europe; his interests lie largely along regulatory lines and his work in Japan has principally to do with quality control, rates and safety matters.

INDUSTRIAL GAS SECTION

F. B. JONES, Chairman C. W. BERGHORN, Secretary J. F. QUINN, Vice-Chairman

Large Volume Water Heating

By RALPH L. MANIER

Chairman, Large Volume Water Heating Committee, Industrial Gas Section

CONSIDERABLE interest has been shown this year in studying the large volume water heating field. Coal dealers, oil companies, gas companies, and even electric companies are spending time and money to sell the heat requirement for satisfying this need as it offers a steady market for heat.

In the May issue of *The Monthly*, I explained how to size up the possibilities of this large requirement of heat. This included a survey to determine the present and potential market in this field, rates and selling policies.

Since writing that article I have received a copy of a complete study on large volume water heating from one of the larger cities. The findings of this study will be covered in the annual report of the Large Volume Water Heating Committee. The investigation included data from 56 apartments, 13 swimming pools, 25 hospitals, and 53 office buildings, banks, clubs, etc.

The estimated use of water in one large office building indicated 2 gallons of hot water per day per occupant, with thirty gallons per day per 10,000 sq.ft. of floor space for cleaning. On this basis the estimate indicated that 2,479 gallons of hot water would be required per day, and that it would take 120 M cu.ft. of manufactured gas per month to heat it. It is interesting to note that actual meter tests of the installation after gas was installed proved that an average of 2,030 gallons of hot water were used per day, and that the gas required per month was 117,600 cu.ft. The over-all efficiency of this job was reported as 58.4 per cent.

Water heating test reports have been sent in, most of which indicate a good healthy condition. Four tests on one of the more recent designs of large volume water heaters checked as follows: 2.1 cu.ft. of manufactured gas per gallon, per 80° rise on average hot water use of 1,050 gallons per day; 1.7 cu.ft. of manufactured gas per gallon on 2,000 gallons per day; 1.81 cu.ft. on 1,779 gallons per day, and 2.18 cu.ft. on 1,256 gallons per day. These figures check well with the performance of the better makes of old line heaters.

Some of the records sent in on miscellaneous types of heaters, and on different rates of water use, varied all the way from 1½ to 4.2 cu.ft. of manufactured gas per gallon, the average being 2.6 cu.ft. per gallon on 13 installations in restaurants. This indicates, in general, that results should be improved on some of these installations by checking for improper combustion, excess chimney draft, poor insulation, dirty heating surfaces, or lime lined heating sections. When excess gas is required to heat a gallon of water the customer is in a willing mood to listen to any salesman for a competitive fuel.

As much effort and money should be spent to keep these jobs sold and prevent the loss to competitive fuel as should be spent to add a new installation on the line. Bad news travels fast. A lost job may cause the loss of many others, besides spoiling the chances for selling new ones.

In studying further into the question of off-peak rates, it would appear that class rates for large volume summer water heating might offer the economic possibilities for some utilities at this time. The Peoples Gas Light & Coke Co., Chicago, and the Boston Consolidated Gas Co., Boston, Mass., have both had some experience in connection with off-peak rates for water heating. The Peoples Gas Light & Coke Co., now has 125 customers on their off-peak rate, and sold 2,489,000 therms in the summer of 1933, as against 1,283,000 therms in the summer of 1932. This shows that they have done some very good work in gaining this extra load. The Boston Consolidated Gas Co. reports 25 customers on their off-peak heating rate.

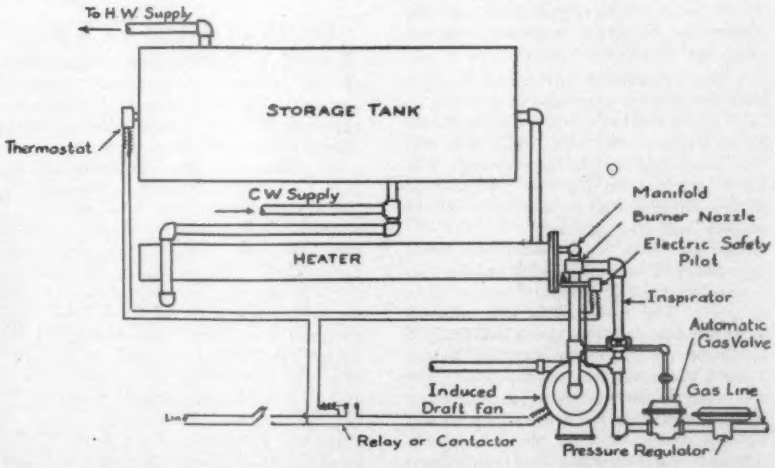
We find many other companies are giving thought to special summer rates for water heating, especially where there is a winter peak load with house heating. Few of these companies have gone so far as to request rates due to stress of business in other lines.

Two new devices have come to the attention of our committee.

The Lewisville Gas & Electric Co. reports excellent results with what is known as the "Unit Volume Automatic Storage System." This is a device which tends to heat water and then deliver a mixture of that hot water and cold water at a very definite temperature. It has been used in connection with shower baths in public schools where there might be danger of scalding should the pupils have the adjustment of the mixing valve in their own hands. It is claimed that this device will hold the delivery temperature within plus or minus 2° F. from the desired temperature.

Another device which is being developed by the Consolidated Gas Company of New York is a gas-fired immersion unit to replace the steam heating coils in an indirect heat exchanger where such heat exchanger is at present in use and supplied with steam from some other heat source than gas. There are many buildings which are now equipped with such steam heated indirect systems, and it is felt that the development of a proper gas-fired immersion heater to replace the steam unit will tend to give exceedingly high fuel efficiency, give a simple installation, and give a reasonable price for the installation. Such a device would also require a minimum of floor space. The design was primarily undertaken with the view of making something available for auxiliary service, which would be low in cost and require a minimum of space. Thus

(Continued on page 251)



Immersion tube water heater developed by the Consolidated Gas Company of New York

TECHNICAL SECTION

Laboratory Tests of Pipe Coatings

By GEORGE H. BOYD
Chairman, Pipe Coatings and Corrosion Committee

THE Subcommittee on Pipe Coatings and Corrosion of the American Gas Association has proposed that Dr. Scott Ewing, A. G. A. research associate, conduct a laboratory test of pipe coatings in cooperation with the National Bureau of Standards and coating manufacturers. The outline of the test follows:

Since the American Gas Association and American Petroleum Institute field tests were started, coating manufacturers have developed new coatings or improved the old ones. Some of these coatings are on the market, along with others which are not in the field tests, and it seems desirable, from the standpoint of the coating manufacturers as well as the user, to learn as much as possible about the value of these new coatings.

The A. G. A. work on coatings was started with the object of developing a laboratory method for testing coatings. It seemed impracticable at that time to make laboratory tests which would be really significant, because the essential properties of a good coating were not known. The field and laboratory work on coatings has shown that two of the most important causes of coating failures are the mechanical action of the soil and the deterioration of bitumen and the fabrics in the coating. The purpose of the proposed tests is to obtain information on the resistance to soil stress and moisture absorption. There are other important properties which a coating should possess, such as resistance to cracking at low temperatures, ease of application, etc. These properties may be of great importance in some cases, but it does not seem desirable to broaden the scope of these tests to obtain data on a great variety of properties. However, the carrying out of the laboratory tests will give information of a general nature on the behavior of the coatings, and it will afford experience which should result in further improvements in testing methods.

Outline of Tests

OBJECT AND PURPOSE—The object of these tests is to secure information on the resistance to soil stress and to water absorption of some of the newer pipe coatings. It is believed that this information will assist manufacturers in judging the value of any new products, and assist users in judging the value of coatings now on the market but not in the A. G. A. or A. P. I. field tests. (See THE MONTHLY, p. 98, March, 1934.)

GENERAL PROCEDURE—The test will be conducted by the American Gas Association in cooperation with the National Bureau of Standards. Manufacturers are invited to submit specifications on any coating they wish to have tested, to the National Bureau of Standards, Washington, D. C., attention Dr. Scott Ewing, on or before July 20. It is impossible to draw up a general statement for all coatings of exactly what should be included in the specification. It should be sufficiently definite so that any one could purchase either the coating or the compounded materials and secure a coating which is to all intents and purposes identical with the one tested. If the specification gives a sufficiently definite description of the coating the manufacturer will be advised to ship his specimens and a one quart sample of the bitumen to the National Bureau of Standards at his own expense and to pay the A. G. A. a fee of $25 to cover the cost of testing the coating.

The coatings should be applied to 2" pipe by the manufacturer in any manner he chooses, and six 24" specimens are to be shipped to the National Bureau of Standards. The pipes should be supported at the ends for shipment, either by sealing tin cans to the ends of the pipe with appropriate bitumen or by inserting both ends of each pipe into holes in blocks which are securely fastened to the ends of the box. If the manufacturer feels that moisture will creep under the coating from the exposed ends, it would be advisable for him to seal the ends of the pipe with tin cans or wooden plugs and bitumen.

TESTING METHODS—After the conductance and pattern tests have been made on four of the specimens, they will be buried in an outdoor soil box. The box will be constructed of porous concrete, will be protected from the rain and will be placed on supports so that it is not in contact with the ground.

The soil will be a moderately heavy clay and will be treated with sodium carbonate to make it hard and tough when it dries. The soil will be treated with the carbonate solution, dried and reduced to small clods, which will be placed around the specimens in the box. The soil will then be thoroughly soaked. After the soil is air dry two specimens of each coating will be removed, photographed and the conductance and pattern test made. The remaining specimens will be removed after two more wetting and drying cycles.

The two other specimens will be used for moisture absorption tests. The details of the procedure for this test will not be decided upon until some additional experimental work has been done.

The construction of the outdoor soil box will be started as soon as it is apparent that a sufficient number of samples will be submitted.

In case facilities will not permit all of the coatings being tested at one time, another group of specimens will be buried as soon as the first group is removed.

DISPOSITION OF RESULTS—The Subcommittee on Pipe Coatings and Corrosion intends to publish the results of the test provided it is properly carried out. The results probably will be published in THE MONTHLY, and will include: (1) the results of pattern and conductance tests both before and after burial of the specimens; (2) the condition of the pipe at the end of the test, described according to the U. P. P. I. Inspection Code; (3) the results of the moisture absorption tests, the details of which cannot now be stated; and (4) any noteworthy observations concerning the appearance or behavior of any coating. The above results together with any discussion, will be published as soon as practicable after the completion of the test, and after being submitted to cooperating coating manufacturers for their criticism.

Additional coatings of special interest to the Subcommittee or the National Bureau of Standards may be included in the test without a fee.

Death of James E. Kane

JAMES E. KANE, assistant secretary and assistant treasurer of Consolidated Gas Electric Light and Power Company of Baltimore, died May 5, 1934, after an illness of three weeks.

Mr. Kane was born in Baltimore on July 18, 1883. He was a graduate of McDonogh School and local schools of business administration, higher accountancy, etc. He entered the employ of Consolidated Gas on August 2, 1909, as clerk in the auditing department. During his twenty-five years of service with the company his ability was recognized by successive promotions, and in January, 1926, he was elected assistant secretary and assistant treasurer, which position he held at the time of his death.

He was a member of the Y. M. C. A., local business organizations, and the American Gas Association.

Heavy Oil Tar Emulsions in the Water Gas Process*

IN TWO PARTS—PART I

By JEROME J. MORGAN[A]
and
CHARLES F. STOLZENBACH[B]

Abstract

EXAMINATION under the microscope shows that heavy oil tar emulsions are composed of droplets of water dispersed in the tar. These droplets are generally surrounded by an outer coating of solid so-called "free carbon" particles, and it has been shown that other conditions being equal, the stability of the tar emulsions increases with increased "free carbon" content.

It has also been observed under the microscope that when the "free carbon" particles are washed away from the water droplets by means of currents set up when the tar is diluted by a tar solvent, the droplets of water still did not coalesce even when they collided.

By observing the evaporation of water from these droplets it has been shown that each droplet is surrounded by a membrane which constitutes the primary stabilizing agent in this type of emulsion. In this respect these emulsions differ from water gas tar emulsions which have previously been studied.

The source of the stabilizing membrane in heavy oil tar emulsions has been found to be the asphaltenes present in the tar, and it has been shown that, in general, the stability of these emulsions increased with the asphaltent content.

By means of a modified laboratory cracking test, the asphaltene content, the free carbon content of the heavy oil tars, and the stability of the heavy oil tar emulsions produced in the gasification of oils at fixed temperatures have been correlated with the asphaltene content of the original oil. However, the tar emulsion forming properties of mixtures of heavy oils cannot be predicted from their asphaltene content.

The asphaltene content and the free carbon content of the tars formed from a West Texas heavy oil have been shown to increase with increased gasification temperature in the range 900°-1700° F., but on account of differences in the specific gravity of the tars, the stability of the tar emulsions formed cannot be correlated with the asphaltene content of the tars produced at these different temperatures.

Introduction

The problem of tar emulsions is not a new one in the gas industry; even in carburetted blue gas plants using straight-run gas oil distillates emulsions were sometimes formed. These emulsions have been investigated by Odell[10] and Briggs[3] who conclude that the stabilizing agent is the so-called "free carbon" of the tar. A variety of methods for the prevention of these emulsions, and for the dehydration of them when formed have been developed.[10] Recently, however, with the extensive use of heavy oils, which are made up of various combinations of distillation and cracking still residues, the problem of tar emulsions in the carburetted blue gas process has again become a serious one.

Carburetted blue gas plants using heavy oils produce on the average two to four gallons of tar emulsions per thousand cubic feet of gas. These emulsions contain about 60 per cent of water. A medium sized plant producing ten million cubic feet of carburetted blue gas per day will produce from 20,000 to 40,000 gallons of tar emulsion. The usual ways of disposing of this tar are as fuel under boilers in the plant, and by sale to tar refiners. In either case the tar emulsions must be dehydrated to a greater or lesser extent before disposal can be made of it. On account of the low value of the tar for either purpose, the dehydration process must be one that can be operated at a low cost. Efforts to solve this problem by preventing the formation of emulsions have not yielded encouraging results. Attempts to dehydrate the emulsions by the methods which have been developed in connection with ordinary water gas tar emulsions or oil field emulsions have not been successful in the case of most types of heavy oil tar emulsions. The heavy oil tar emulsions are better stabilized, and appear to be quite different from the types of emulsions which have previously been studied.

The desirability of developing a method for preventing heavy oil tar emulsions, or for dehydrating them when formed, has been indicated. On account of the lack of information on the nature and properties of these emulsions, it was necessary first to investigate these points. It is with this phase of the problem that the present investigation is concerned.

Previous Work

The status of the previous work by Odell and Briggs on water gas tar emulsions when a gas oil or a light petroleum residue is used as the carburetting medium has already been indicated. Odell[10] lists a number of methods used for breaking these emulsions, Dow[5] gives methods used for breaking oil field emulsions, and among the patents are the following methods: (1) heating to reduce the viscosity of the tar[5, 10, 12, 16, 21]; (2) passing the tars, sometimes heated, and sometimes cold through orifices, corrugated tubes, shavings, or between adjacent surfaces[5, 15]; (3) applying an electrostatic field[5, 13, 19]; (4) chemical means[5, 14, 16, 20, 29]; (5) distillation or evaporation[5, 17]. None of these have given consistently satisfactory results when applied to the dehydration of heavy oil tar emulsions.

Of the previous investigations in oil field emulsions, Sherrick[25] concludes that the main emulsifying agent is hydrated earthy material, probably in connection with absorbed asphaltic substances. He states that some of the asphalt-like bodies are present in crude oils as oil soluble colloids, but he does not think that they are effective as emulsifiers, since all asphaltic base oils do not emulsify easily. Ayres[2] gives data connecting the emulsifying properties of 82 samples of crude oils and their content of earthy material. Dow[5] in Investigation No. 2682 shows that troublesome oil field emulsions are greater in the case of asphaltic petroleum oils. In Investigation No. 2692 he demonstrated that emulsions are stabilized (1) by lowering of the interfacial tension between the two phases, (2) by having an interface composed of a third substance partially dissolved in both phases, (3) by having a persistent film of colloidal material between them, and (4) by having a film of solid mineral matter. He determined that the asphaltic material is concentrated in the oil from the emulsions, and states that it probably produces emulsions by covering the surface of the water drops. He demonstrated that a stable emulsion of kerosene and water could be produced by using the mineral matter as a stabilizing agent, and concluded that this acts as the main stabilizer in oil field emulsions. He also discussed the various methods used for dehydrating oil field emulsions, none of which have been entirely successful with heavy oil tar emulsions. Richardson[24] also concluded that the main stabilizing agent in Trinidad asphalt was the finely divided mineral matter.

Except for analyses and distillation curves, there is no data in the literature regarding the heavy oil tar emulsions formed in the carburetted blue gas process. A resumé of the methods used in the attempt to dehydrate these emulsions is given by Kellogg.[7]

EXPERIMENTAL

Materials

The heavy oil tar emulsions used in this investigation were obtained from the carburetted blue gas plants of the Consolidated Gas Company of New York, and were formed in their regular operation when

* Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Faculty of Pure Science of Columbia University.

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[B] Junior Chemist with the Consolidated Gas Company of New York, 4 Irving Place, New York City.

distillation residues of petroleum oils from East Texas, West Texas, and East Venezuela fields were employed as carburetting oils. These emulsions were black, viscous materials, creamy in appearance and containing about 60% of dispersed water. In some of the samples small amounts of water separated after standing about two months at room temperature. In the more stable emulsions, no water separated even after standing at room temperature for one year. It was possible, however, to separate some water, which collected as large drops, by rubbing the emulsion on a smooth surface. Microscopical examination showed that the water is dispersed in the tar in the form of droplets, whose diameters ranged from 3 to 100 microns. The small droplets were spherical in shape, while the larger ones were irregular.

In attempting to find a correlation between the oils cracked and the tars produced, the following heavy oils were employed:

Oil	*Specific Gravity, 60°/60° F.*	*° A.P.I. Gravity, at 60° F.*	*Asphaltenes, % by Wt.*
Topped Pennsylvania Crude	0.8498	35.0	0.49
East Texas Heavy Oil	0.9125	23.6	1.64
West Texas Heavy Oil	0.9400	18.4	1.93
East Venezuela Heavy Oil	0.9685	14.4	12.60
California Heavy Oil	0.9800	12.6	14.00
Venice, California Heavy Oil	0.9419	18.8	14.40
50% East Texas and 50% West Texas Heavy Oils	0.9261	21.2	1.78
40% East Texas and 60% East Venezuela Heavy Oils*	0.9610	15.7	9.12
50% East Texas and 50% California Heavy Oils*	0.9600	15.9	11.05

* Obtained as a mixture, not made up from the heavy oils listed above.

Microscopical Examination

The microscopical examination of thin layers of heavy oil tar emulsions is a rather difficult process on account of their physical nature. A drop of emulsion will not spread when placed upon a microscope slide glass because of its high viscosity. The emulsions are completely opaque except in thin layers. Heating or agitation of the drop or squeezing between two glass plates partially destroys the structure of the emulsion. In the attempt to prepare the emulsion for microscopical examination, a considerable number of solvents were tried. Only nitrobenzene and m-chlor-benzene, which are good tar solvents[8] gave satisfactory results.

In the procedure developed, the slide for the microscope was moistened with nitrobenzene, a drop of emulsion placed on it, and then a drop of nitrobenzene was allowed to fall upon the emulsion. The tar was dissolved rapidly, leaving the water dispersed in the solution. While there is a small amount of coalescence of the water drops, the degree of dispersion is not much affected. In the addition of nitrobenzene the small drops of water receive a considerable velocity, and tend to move out of the microscope field. They are best observed when nitrobenzene is brought to the edge of a tar drop and allowed to dilute the tar. Since the solution of heavy oil tar in nitrobenzene is still highly colored, a powerful source of light was required. In this work, a carbon arc lamp was used, together with a heat filter and a water cooled microscope stage. To increase the magnification, and to facilitate measurements, the microscope field was projected by a mirror upon a twelve inch square of ground glass. This gave a magnification of 166 when the 10X eye piece and 16 mm. objective were used, and with a 25X eye piece and the same objective, the magnification was 379.

The diluted emulsion appears on the screen as a dark-yellow or brown field in which a large number of water droplets appear as bright colorless spheres. A few of the larger drops of water are irregular in shape or flattened. When the tar was not much diluted, the water droplets are seen to be entangled in a network of a black, opaque, finely divided solid material. This material is insoluable in benzol, and in the diction of the tar chemist is termed "free carbon." This "free carbon" adhering to the surface of the water particles, prevents their contact with each other, and their coalescence. A number of water droplets when thus coated may form an apparently solid mass which has a skeleton of free carbon covering and enmeshing the water droplets.

When the tar on the slide, prepared as above described, is further diluted with nitrobenzene or benzol, currents are produced which wash away the "free carbon" from the surface of the water droplets. The sample under observation then appears as a brown solution in which a number of small clean droplets of water are dispersed. These water droplets are moved about in the field of view by liquid currents. However, in the emulsions examined, when two or more of these water drops collided, even when moving with sufficient velocity to deform each other, they rebounded without coalescing. This indicated that each water droplet was surrounded by an invisible film which prevented their coalescence.

If one of these droplets was closely observed while the water evaporated on account of the heating of the slide, it was seen that the surface of the droplet became wrinkled and folded, and that when all of the water had evaporated, a wrinkled membrane was left on the area where the water droplet had been. This demonstrated the presence of a material film about each water particle. It was found that this membrane was insoluble in benzene, carbon tetrachloride, toluene, xylenes, petroleum ether, ethyl ether, hexane, gasoline, acetic acid, nitrobenzene and tetralin. It was soluble in acetone, carbon disulphide and chloroform. When one of the last three solvents was added to a slide containing the water droplets, it was observed that collisions were then followed by a coalescence, indicating that the stabilizing membrane had been dissolved. In a short time after the addition of acetone, carbon disulphide, or chloroform to a slide containing an emulsion diluted with nitrobenzene all of the small drops of water coalesced into an irregular body of water distinct from the tar solution.

These observations therefore demonstrate that heavy oil tar emulsions are stabilized; first by an enveloping membrane surrounding each water droplet which prevents their coalescence even in the absence of "free carbon," and second, when the so-called "free carbon" is present, it may collect around the water droplets and acts as a secondary stabilizing agent.

Free Carbon as a Stabilizer

"Free Carbon" is a name given technically to that portion of a tar which is insoluble in benzene or commercial benzol.

As obtained from the tars by extraction with commercial benzol, "free carbon" is a finely divided, black, solid material. When heated to 265°-285° F. (130°-140° C.), it fuses to a black viscous liquid. If the heating is long continued, the liquid effervesces and evolves steam, carbon dioxide and oil vapors. On cooling the liquid a black amorphous solid is obtained, which, when pulverized, resembles the original free carbon. "Free carbon" is somewhat similar in its coking properties to the bitumen in coal.

Chemical analyses show that "free carbon" is not elementary carbon. It contains some ash and small percentages of hydrogen, oxygen, sulphur, and nitrogen. Qualitative tests showed the absence of halogens. Qualitative analysis of the ash indicated that it was principally iron oxide and silica. Table 1 gives ultimate analyses made upon a sample of "free carbon," and upon the residues obtained by the extraction of this "free carbon" by a number of solvents.

As has been shown by other workers[3, 5, 10] "free carbon" acts as a solid stabilizer for water gas tar emulsions. "Free carbon" not only acts as an emulsion stabilizer, but the presence of considerable amounts in the tar also greatly increases the apparent viscosity, or plasticity, of the tar, and hence further hinders separation of water from tar emulsions. Figure 1 shows the relation between the "free carbon" contents and the apparent viscosity of samples of tars and tar emulsions. These apparent viscosities were determined with the Saybolt Furol viscosimeter.[1a] The results are expressed in the number of seconds required for

60 ml. of tar at 212° E. to flow through the orifice. The same quantity of water at 122° F., requires 4.5 seconds by calculation. Since the tars and tar emulsions examined were not homogeneous liquids, this method does not measure the true viscosity, but is a measure of the plasticity of these substances, and as such gives a useful indication of the difficulty of separating water from the emulsions. The samples used in collecting this data for the curve were prepared as follows:

A sample of rather fluid heavy oil tar containing 25.0 per cent by weight of "free carbon" and 18.5 per cent by weight of asphaltenes was diluted threefold with commercial benzol, filtered through cloth in a filter press, and subsequently through porous alundum plates, thus removing most of the "free carbon." The benzol was then removed by distillation. The resulting sample of tar contained 0.96% by weight of "free carbon," but was otherwise of the same composition as the original tar. By mixing portions of this filtered tar with different amounts of the original tar a series of tars differing only in "free carbon" content was produced.

To study the stability of emulsions formed from tars which differed only in their "free carbon" content, emulsions were prepared by agitating a portion of each of the prepared tars with an equal volume of water. The stability of each emulsion was studied by determining the water separated by heating at 170° and at 190° F. (76.7° and 87.8° C.), in a thermostatically controlled water bath for various periods of time.

The average diameter of the water particles in the original tar emulsion as well as in the prepared emulsions after treatment was determined. In determining the average size of the water particles, the diameters of 700 to 1200 drops were measured, using the microscope arrangement previously described. These diameters were then grouped into various ranges, and a volumetrically weighed average diameter obtained according to the method described by M. Fain[6].

The results of these experiments, as given in Table 2, and Figure 2 show:

(1) That increases in the "free carbon" content up to about 6% had little effect upon the stability of the emulsions.

(2) That there is a rapid increase in stability between 6% and 8.5% of "free carbon," but that increasing the "free carbon" content beyond this point produces no change in the stability detectable by the methods used.

(3) That the dispersion of water decreases as the tar is heated and as the length of heating is increased, and that the water separated increases as the temperature of heating is raised, and as the time of heating is increased.

(4) Finally, that in this series of tar emulsions, the "free carbon" is not the only stabilizer. If the curves in Figure 2 are extrapolated to a zero free carbon content, there is indication that this emulsion would still be relatively stable.

In the examination of the heavy oil tar emulsions under the microscope it was observed that the water droplets were enveloped by a membrane which prevented their coalescence. The experiments with "free carbon" indicate that it is not the only stabilizer present in the heavy oil tar emulsions. Together these observations point to the enveloping membrane as the primary stabilizer in this type of emulsion.

TABLE I

ANALYSIS OF "FREE CARBON" AND SUBSEQUENT EXTRACTION RESIDUES.

	Carbon, % by Wt. (a)	*Hydrogen, % by Wt. (a)*	*Sulphur, % by Wt. (b)*	*Nitrogen, % by Wt. (c)*	*Oxygen, % by Wt. (d)*	*Ash, % by Wt. (a)*	*Percentage of "Free Carbon" Insoluble*
"Free Carbon" (Insoluable in Benzol)	88.41	2.23	2.16	0.14	3.19	3.87	100.0
Residue from Extraction of "Free Carbon" in Soxhlet with:							
Acetone	86.90	2.26	2.24	0.69	2.98	4.93	83.7
Chloroform	84.23	2.48	2.05	0.66	5.73	4.85	78.0
Carbon Disulphide	87.30	2.50	1.93	0.63	2.64	4.90	80.0
Acetic Acid	87.46	2.10	2.18	0.67	4.22	3.37	61.5
Tetralin	85.03	2.21	2.18	0.61	4.17	5.84	70.5
Nitrobenzene	85.60	1.50	2.46	0.64	2.91	7.69	52.0

Tetralin = tetra-hydro-naphthalene.
(a) Determined by combustion.
(b) Determined by bomb combustion.
(c) Determined by Kjeldhal.
(d) Determined by difference.

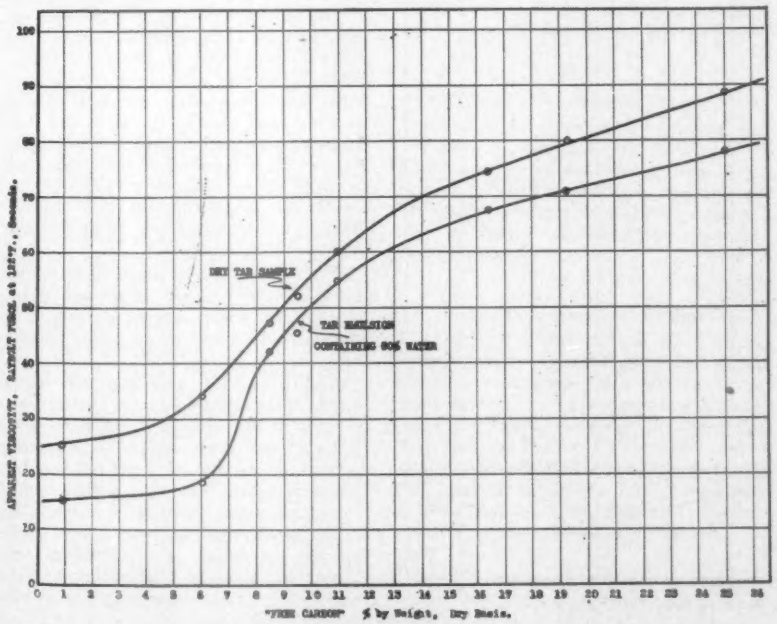

Figure 1
Apparent viscosity—"free carbon" relationship for heavy oil tars and emulsions

Determination of the Source of the Stabilizing Membrane

In an attempt to determine the source of the stabilizing membrane, a one liter sample of the original heavy oil tar used in the study of the effect of the "free carbon" content was slowly distilled and fractionated up to 300° C., using a ten-inch, glass-head and jack-chain packed Hempel column. The distillate was divided into fifteen fractions and the emulsifying power of each fraction determined by agitating with distilled water. Emulsions were produced by the following fractions, namely: the styrene fraction, 275°-302° F. (135-150° C.); the indene fraction, 347°-363° F. (175-185° C.); the naphthalene fraction, 419°-428° F. (215-220° C.); and the methylnaphthalenes fraction, 437°-455°F. (225-235° C.). These emulsions were not stable, except that produced by the fraction containing naphthalene. This fraction, on account of its high naphthalene content was semi-solid and the naphthalene acted as a solid stabilizer. The presence of styrene and indene in their respective fractions was demonstrated by their polymerization and precipitation by anhydrous

TABLE 2

SEPARATION OF WATER FROM HEAVY OIL TAR EMULSIONS

Emulsion Number:	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
"Free Carbon," % by Weight, Dry Basis	0.96	6.02	8.50	9.42	10.94	16.40	19.22	25.00
Apparent Viscosity, Saybolt Furol at 122° F., Seconds,								
Dry Sample	25	34	48	52	60	74	80	88
Wet Sample	15	18	43	46	54.5	67	71	77
Initial Water Content of Emulsion	50.0	48.0	50.0	48.0	50.0	50.0	50.0	50.0
Separation of Water, % of initial water content, at 170° F.,								
0.5 hours,	12.5	8	0	0	0	0	0	0
1.0 hours,	20	16.7	4	0	0	0	0	0
2.0 hours,	32	33.3	8	8	0	0	0	0
at 190° F.,								
0.5 hours,	12	12.5	0	0	0	0	0	0
1.0 hours,	28	25.0	8	0	0	0	0	0
2.0 hours,	48	41.5	12	12	8	8	4	4
Average Diameter of Water Droplets, Microns.								
Initially	7.4	20.8	32.0	9.1	9.3	9.5	7.5	8.5
After Treatment at 170° F.,								
0.5 hours,	13.1							
1.0 hours,	23.7	33.8	29.8	28.0	24.6	23.2	20.0	
2.0 hours,	69.3	29.2	35.1	44.4	29.4	28.0	25.0	
at 190° F.,								
0.5 hours	79.2							
1.0 hours,		44.0	42.3	51.0	41.5	42.0	35.0	
2.0 hours,	91.0	77.1	54.2	60.4	54.6	51.0	52.0	

stannic chloride. None of the other fractions produced more than a temporary emulsion. It was also shown that emulsions produced by styrene, which was synthesized in the laboratory, were unstable, and that naphthalene stabilized emulsions only when present in quantities large enough to act as a solid stabilizer. It was indicated, therefore, that the portion of heavy oil tars distilling below 300° C., had little to do with the stabilization of the heavy oil tar emulsions.

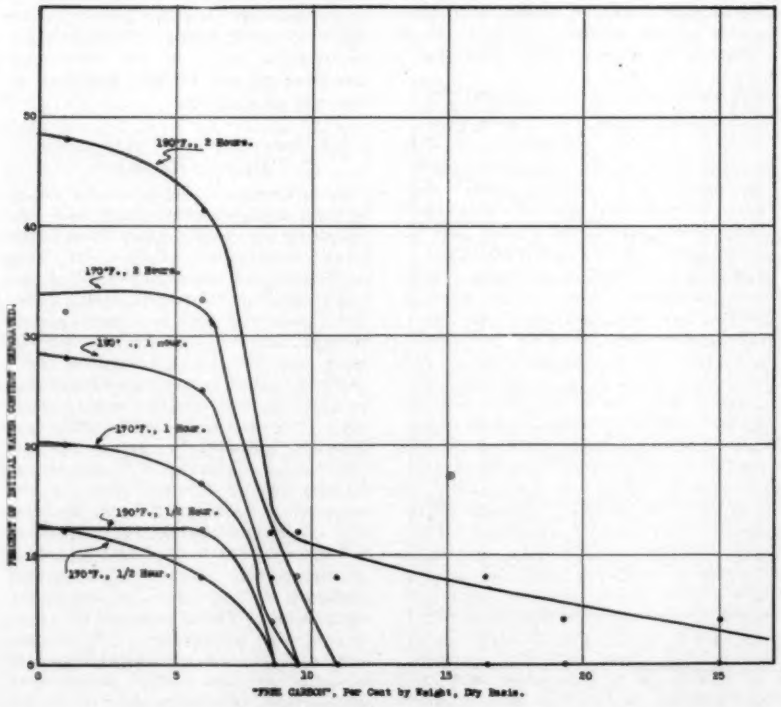

Figure 2

Relation between water separated from tar emulsion by heating and "free carbon" content

In a further attempt to determine the source of the stabilizing membrane, samples of heavy oil tars, after removal of the "free carbon," were separated into asphaltenes, asphaltic resins and residual oils by a modification of the method of Marcusson,[8] as follows: A 5-10 gram sample of dry tar or 50-100 grams of dry oil is weighed into a 600 ml. beaker. About 200 ml. of commercial benzol is added, and the mixture brought to a boil on an electric hot plate, with occasional stirring. The hot solution is filtered through a dry weighed porous alundum (RA 96) crucible, which is then washed with fresh benzol until the washings are colorless. The residue in the crucible may be dried and weighed as "free carbon."

To the benzol solution is added 25 ml. of a paraffin oil whose asphaltene content is known and the benzol removed from the solution by evaporation on a hot plate. The remaining oil is then allowed to cool to room temperature and 400-500 ml. of petroleum ether distilling between 40°-60° C., is slowly added with vigorous stirring. The whole is allowed to settle in a refrigerator for at least two hours, and preferably overnight. The asphaltenes will be precipitated by this method as a hard granular powder. If the addition of the paraffin oil be omitted, the small volume of tar becomes gummy on the addition of the petroleum ether, and the asphaltenes cannot be collected. The solution is filtered by suction through a dry, weighed alundum crucible and washed with fresh petroleum ether until the filtrate is colorless. The residue is dried for an hour at 100° C., and weighed.

The filtrate contains the residual tar oils, as well as the asphaltic resins. To recover the resins the filtrate is evaporated to remove most of the petroleum ether and then cooled. An equal volume of 95% ethyl alcohol is added, and then just enough water to cause a faint cloudiness which is removed by the addition of a little more alcohol. The asphaltic resins will be precipitated as a reddish-brown powder, which may be filtered and weighed after drying.

The filtrate may be distilled or evaporated to remove the petroleum ether, alcohol and water, leaving a solution of the residual tar oils in the added paraffin oil.

Asphaltic acids and asphaltic anhydrides were determined by titration according to Marcusson's[8] original method. These as well as the asphaltic resins were present in the tar in small percentages, and were shown by tests to form unstable emulsions when mixed with non-emulsifying paraffin oils and water. The residual tar oil, which is very viscous and denser than water also did not form emulsions with water, either alone or in admixture with other oils.

(TO BE CONCLUDED NEXT MONTH)

Appliance and Equipment Developments

New Compressor

A bulletin of original design has just been issued by Ingersoll-Rand describing the advantages of the company's two-stage, air-cooled portable compressor. This unit is built in five sizes, ranging from 75 to 370 cfm. piston displacement. It is supplied in a large variety of mountings—from a steel-wheel mounting, with a towing speed of 10 mph., to the two-wheel trailer mounting, which can be towed by a truck at 35 mph. Both the oil-engine- and the gasoline-engine-driven units are shown in the bulletin, which gives details as to the amounts of fuel savings that can be expected, compared to operation of single-stage, water-cooled compressors. Copies of the new bulletin (No. 2100) may be obtained from Ingersoll-Rand Company, 11 Broadway, New York City, or from any Ingersoll-Rand branch office.

New Portable Generator

The Linde Air Products Company, 30 East 42nd Street, New York, N. Y., announces a new Oxweld generator, known as the Oxweld Type MP-4 Portable Acetylene Generator. It is intended for portable service only, and is specially designed to withstand the abuse encountered in such service, particularly in overland pipe construction.

Radiant Heat—No Flame

The Burdett Manufacturing Company, 19 North Sheldon Street, Chicago, Ill., has published a bulletin describing its new radiant heat gas burner. This gas burner produces directed radiant heat without a flame. It is designed for industrial, commercial and domestic use where direct radiant heat is required.

Get Air Conditioning Patent License

Lewis Air Conditioners, Inc., Minneapolis, Minnesota, have licensed the Julien P. Friez and Sons, Inc., Baltimore, Maryland, and the Minneapolis Honeywell Regulator Company, Minneapolis, under Patent No. 1,785,741, entitled "Air Conditioning Systems." The Detroit Lubricator Company, Detroit, Michigan, previously had been licensed under this same patent.

This patent contains broad claims relating to any air conditioning system or circuit wherein a humidity regulator is rendered operative by a thermally actuated regulator only when the heating medium has attained a temperature adequate for efficiently evaporating moisture and/or otherwise conditioning the air. The patent in some of its claims further relates to any air conditioning system where a fan is used for causing air to travel through air conditioning means and where the operation of the fan is controlled by the thermally actuated regulator and rendered operative only when the medium affecting the regulator has attained a predetermined temperature.

Contributions of news items by manufacturers of gas appliances and equipment to this department will be welcomed by The A. G. A. Monthly. On account of space limitations, all announcements of new products, improvements, etc., should be limited to about 100 words. No attempt will be made to describe each product or give details of construction. For such details address the manufacturer direct. Where justified, photographs will be used to illustrate these brief items. All contributions to this department should be addressed to C. W. Berghorn, Secretary, Manufacturers' Section, American Gas Association, 420 Lexington Ave., New York, N. Y.

Testing Welders and Their Welds

Anyone concerned with the hiring of welders will be interested in the recent publication by The Linde Air Products Company, 30 East 42nd Street, New York, N. Y., of a 24-page illustrated booklet entitled "The Testing and Qualification of Welders." The purpose of this booklet is to outline simple tests for measuring the ability of welders, the first of the six essential steps in every procedure control for oxyacetylene welding.

"Two-in-One Roaster-Baker"

The G. S. Blodgett Co., Inc., Burlington, Vermont, has issued a bulletin describing a new-type baking and roasting oven. This unit affords two ovens, each compartment having separate burners, and each compartment having its own independent automatic heat control.

UCC Continues Fair Exhibit

Exhibits of Union Carbide and Carbon Corporation at A Century of Progress, in Chicago, are continued this year. In keeping with the progressive nature of A Century of Progress numerous improvements have been made in the UCC exhibit, in the Hall of Science. The popular "Story of Air" again is portrayed. The "Liquid Air Demonstrations" which played to capacity audiences all last summer are repeated.

McCormick Appointments

The J. H. McCormick & Co., Williamsport, Pa., manufacturers of air conditioning, humidifying and gas house heating equipment, and tank heaters, announces the appointment of S. M. Washabaugh as general sales manager. For the past ten years Mr. Washabaugh has been connected with the Spencer Heater Company, in the general sales department.

McCormick & Co., also announce the appointment of G. T. Peifer, formerly connected with the Spencer Heater Company, as their district representative located at 334 Fourteenth Street, Buffalo, N. Y.

Series of Dealer Meetings

A series of one-day meetings for automatic heat dealers is being planned by the Penn Electric Switch Co., Des Moines, Iowa. A. L. Ruble, Boston representative of the company, will hold the first meeting in July, for all Maine dealers. The meeting is scheduled for Portland, and more than 200 dealers have been asked to attend. At each meeting, the principles and application of the new Penn Temtrol will be presented by means of illustrated charts. It is hoped, through the meetings, dealers will secure a more thorough understanding of all automatic control problems in order that they may simplify installation and service work and assure greater operating efficiency of the heating equipment they sell. The Maine meeting will be followed just as quickly as arrangements can be completed in every major heating State, with special meetings in metropolitan areas.

Henry Obermeyer Heads P. U. A. A.

HENRY OBERMEYER, assistant to vice-president of the Consolidated Gas Company of New York, and Chairman of the A. G. A. Publicity and Advertising Committee, was elected president of the Public Utilities Advertising Association at its convention in New York, June 19.

Other officers elected are: J. R. Pershall, advertising manager, Public Service Company of Northern Illinois, Chicago, first vice-president; D. D. Parry, advertising manager, Central Hudson Gas & Electric Corporation, Poughkeepsie, N. Y., second vice-president; Kenneth Magers, publicity manager, Union Gas & Electric Company, Cincinnati, O., third vice-president; H. W. Olcott, Jr., advertising manager, The Philadelphia Gas Works Company, Philadelphia, Pa., secretary; Howard F. Weeks, assistant director, editorial bureau, Consolidated Gas Company of New York, treasurer.

A feature of the convention this year, as in past years, was the presentation of awards in the annual "Better Copy Contest," sponsored by the association by L. D. Gibbs, of Boston, Mass. A list of the awards was published in the June issue of THE MONTHLY.

Monthly Summary of Gas Company Statistics

For Month of April, 1934

Issued June, 1934, by the Statistical Department of the American Gas Association
420 Lexington Avenue, New York, N. Y.

PAUL RYAN, Chief Statistician

COMPARATIVE DATA ON THE MANUFACTURED AND NATURAL GAS INDUSTRY FOR THE MONTH OF APRIL

	Month of April			Four Months Ending April 30		
	1934	1933	Per Cent Change	1934	1933	Per Cent Change
Customers						
Domestic (Including House Heating)	14,646,500	14,408,400	+ 1.7			
Industrial and Commercial	755,900	735,300	+ 2.8	*See April*		
Total	15,402,400	15,143,700	+ 1.7			
Revenue (Dollars)						
Domestic (Including House Heating)	46,089,000	46,064,800	+ 0.1	203,149,100	203,088,500	0.0
Industrial and Commercial	16,198,300	13,532,200	+19.7	66,694,200	58,002,300	+15.0
Total	62,287,300	59,597,000	+ 4.5	269,843,300	261,090,800	+ 3.4

COMPARATIVE DATA ON THE MANUFACTURED GAS INDUSTRY FOR THE MONTH OF APRIL

Customers						
Domestic	9,363,900	9,295,100	+ 0.7			
House Heating	93,400	59,500	+57.0			
Industrial and Commercial	442,800	433,400	+ 2.2	*See April*		
Miscellaneous	10,500	8,500	—			
Total	9,910,600	9,796,500	+ 1.2			
Gas Sales (MCF)						
Domestic	20,484,200	20,911,800	— 2.0	84,007,100	84,210,100	— 0.2
House Heating	3,348,200	2,320,100	+44.3	17,335,300	11,443,600	+51.5
Industrial and Commercial	7,871,700	6,067,800	+29.7	30,145,800	24,286,700	+24.1
Miscellaneous	182,100	171,900	—	807,800	782,800	—
Total	31,886,200	29,471,600	+ 8.2	132,296,000	120,723,200	+ 9.6
Revenue (Dollars)						
Domestic	24,683,800	25,392,500	— 2.8	100,932,500	102,264,500	— 1.3
House Heating	2,151,500	1,681,200	+28.0	10,916,600	8,117,200	+34.5
Industrial and Commercial	5,899,700	5,385,500	+ 9.5	23,700,200	22,143,800	+ 7.0
Miscellaneous	134,100	132,600	—	569,600	570,900	—
Total	32,869,100	32,591,800	+ 0.9	136,118,900	133,096,400	+ 2.3

COMPARATIVE DATA ON THE NATURAL GAS INDUSTRY FOR THE MONTH OF APRIL

Customers						
Domestic (Including House Heating)	5,189,200	5,053,800	+ 2.7			
Commercial	276,600	269,400	+ 2.7			
Industrial	24,100	22,300	+ 8.1	*See April*		
Miscellaneous	1,900	1,700	—			
Total	5,491,800	5,347,200	+ 2.7			
Gas Sales (MCF)						
Domestic (Including House Heating)	29,755,800	28,831,200	+ 3.2	145,274,300	145,851,100	— 0.4
Commercial	5,483,900	4,848,600	+13.1	27,422,200	26,166,600	+ 4.8
Industrial	46,856,400	35,279,200	+32.8	185,731,900	143,426,100	+29.5
Miscellaneous	976,400	649,900	—	4,392,100	2,911,600	—
Total	83,072,500	69,608,900	+19.3	362,820,500	318,355,400	+14.0
Revenue (Dollars)						
Domestic (Including House Heating)	19,253,700	18,991,100	+ 1.4	91,300,000	92,706,800	— 1.5
Commercial	2,425,300	2,243,200	+ 8.1	11,883,300	11,478,500	+ 3.5
Industrial	7,571,100	5,647,900	+34.1	29,810,700	23,274,400	+28.1
Miscellaneous	168,100	123,000	—	730,400	534,700	—
Total	29,418,200	27,005,200	+ 8.9	133,724,400	127,994,400	+ 4.5

Gas Revenues Gain in April

MANUFACTURED and natural gas companies reported revenues of $62,287,300 for April, 1934, as compared with $59,597,000 in April, 1933, an increase of 4.5 percent.

Revenues of the manufactured gas industry aggregated $32,869,100 for the month, representing only a slight increase over the corresponding month a year ago. Revenues of the natural gas industry, however, totalled $29,418,200 for April or 8.9 percent more than for April, 1933.

Sales of manufactured gas in April for domestic uses were 2 percent below the preceding year. Sales to industrial-commercial users, however, registered a distinct upturn, manufactured gas companies reporting an increase of nearly 30 percent in this class of business, while for the natural gas industry the gain was nearly 33 percent.

Large gains were reported by the manufactured gas utilities in sales of gas for house-heating purposes which increased more than 44 percent from the April, 1933, figure.

For the four months ending April 30, manufactured and natural gas revenues aggregated $269,843,300, an increase of 3.4 percent over the first four months of 1933. Revenues from domestic consumers were unchanged for the period. Revenues from industrial and commercial users, however, increased 15 percent over the first four months of 1933.

GAS EXHIBIT IN NEW SETTING AT WORLD'S FAIR

(Continued from page 223)

from the lake, a gas heater provides cheerful warmth in this cozy atmosphere.

On the west wall, over the big exit doors, a message reads: "Gas, the most dependable and least expensive of modern fuels."

Just beyond this door is a graphic demonstration of a gas conversion installation. Here a gas burner will be installed in a furnace, using solid fuels, which will be converted to gas usage to demonstrate the speed and efficiency that accompanies gas heat installations.

Next to this, more wonders are revealed. Two automatic gas water heaters are set up. Visitors are invited to turn a faucet and then see the thermostat in operation. Above are more murals and a slogan: "The basement is part of home sweet home." Another piece of modern gas heating equipment and an air conditioner complete the exhibit.

The central theme of the Gas Industry Exhibit is "Gas for the Home." In cheerful colors, the display proves itself to be one of the major exhibits in this great Exposition, because it all becomes so very striking by reason of its simple, understanding treatment.

OPERATIONAL CHARACTERISTICS OF DOMESTIC GAS APPLIANCE PRESSURE REGULATORS

(Continued from page 230)

conditions. No item is overlooked in the requirements. Life tests and many construction clauses are even provided. If a listed regulator is considered for any given application, only one precaution need be taken; namely, the regulator manufacturer's specified rating for the device must exceed or equal the maximum rating of the appliance upon which the regulator is to be installed.

The value of the service soon to be inaugurated by the American Gas Association Testing Laboratory in certifying domestic gas appliance pressure regulators is but a part of the gain to be realized by the industry from the Association's comprehensive and recent gas appliance accessory listing program. Nationally accepted standards are now available for draft hoods, gas conversion burners, and gas burner valves; and in a very short time similar requirements will exist for such appurtenances as relief and automatic gas shut-off valves for use on water heating systems, water heater, gas range, and space heater thermostats, automatic main gas-control valves, automatic devices designed to prevent escape of unburned gas, and semi-rigid gas appliance tubing and fittings.

Though the unqualified A. G. A. approval now customarily granted to complete gas-burning appliances will not be accorded the accessories above listed (since their successful operation depends in part upon the manner of their installation even though they may have passed rigid tests and inspection), it is expected that great service to the industry will have been done by establishing a program which will both guard consumers against those devices which are faulty in operation or construction and tend to elevate the general level of appliance appurtenance design and usefulness.

LARGE VOLUME WATER HEATING

(Continued from page 243)

far it appears that the design has met these requirements very satisfactorily, and in addition it gives efficiencies and standby results which are quite favorable compared with other heaters which we use.

Should there be other developments in the large volume water heating field with which our committee has not been acquainted, I would appreciate it very much if descriptive matter and operating results would be sent to the writer.

Requests have been made to this committee that the water heater manufacturers change the basis for rating the capacity of their heaters. Most of these heaters have been rated on a 60° rise in temperature, and it has been pointed out that the fluctuation in cold water temperature is such that in the majority of cases, to give sufficient water heating capacity in the winter, at least an 80° rise will be required in large volume installations. The Large Volume Water Heating Committee has, therefore, written the Specification Committee, requesting that they give this question consideration.

If this effort and interest in the large volume water heating field is maintained, there is every indication that next year will see a much larger volume of gas sold to heat water.

Colonel Carr Honored by Crown

In the King's Birthday Honors List the Order of the British Empire (Military Division) was conferred by King George V upon Lieutenant-Colonel William Moncrieff Carr, Honorary Colonel of the 55th West Lancashire Divisional Engineers, Territorial Army. Colonel Carr was a member of the British delegation to the International Gas Conference and Annual Convention of the American Gas Association in Chicago, last September.

Personnel Service

SERVICES OFFERED

Engineering executive with twenty years' unusually broad technical and practical experience in management, operation, financial and public relations problems of gas companies, with especial training in rate developments; qualified consultant and expert witness. **854.**

Manager-gas engineer (46) married. Technical education, twenty years' experience in construction, engineering, manufacture, distribution, finance, management, sales and public relations; wide experience. Build up property or develop sales per year per customer, small or large property. **858.**

Gas engineer (34) technical graduate, with several years' broad experience with affiliated holding and operating companies in high and low pressure distribution, coal and water gas manufacture, natural and refinery gas, design and installation of distribution and transmission systems; specialist with excellent record of results in mitigation of unaccounted for gas. **859.**

Utilization sales engineer (39) with unusually broad experience in employ of gas companies and equipment manufacturers service. Technical graduate and thoroughly well qualified for domestic commercial and industrial sales or research. **861.**

Manufacturers representative with many years' experience and with headquarters and staff in New York City, covering Eastern territory, will be glad to represent another non-competing manufacturer, preferably industrial specialties. **862.**

Honest, steady, well-educated, thoroughly trained gas man desires connection where his fifteen years of varied experience can be used. Has served in plant and distribution operation, as **district manager**, headed gas department of combination company; understands safety work and has devoted considerable study to rate making. **864.**

Manager—Formerly executive in operating charge for corporation having numerous gas properties. Has held management positions both large and small cities. Experience as executive foreign operations and engineering for holding companies. Thorough knowledge of gas business including operation, rates, merchandising and public relations. Excellent education and record. Age fifty. **865.**

Advertising, Publicity, New Business or Personnel. University Graduate, one year with a New York newspaper, some merchandising experience with a large department store and two and a half years with a gas company doing **sales** promotional work and editing the company paper. **866.**

Combination Gas and Electric **Utility** man. Expert on meters, experienced Superintendent of distribution, practical engineer. Age 36, speaks English and Spanish. **867.**

Manufacturers agent, graduate engineer, many years' sales experience and unusually wide acquaintance with executives of gas companies, wholesale plumbers and jobbers. Covers eastern territory headquarters in New York City. Excellent sales record and wants an additional non-competing line of interest to present clientele. **869.**

Manager. Due to a consolidation of Gas and Electric properties, a Manager is seeking a change. One with wide practical experience and who has been successful. **871.**

Engineering graduate with several years' varied experience in the design, manufacture, erection and operation of gas plant equipment, and in supervision of plant operation, desires **supervisory** or technical position with small gas company. Married. **872.**

Fourteen years' experience in testing, design and manufacture of gas appliances and controls. Thoroughly familiar with service conditions on all types of gas by personal experience in national laboratory and in the field. Desire permanent or consulting connection with manufacturer, or with gas company in **utilization** and **sales.** **873.**

SERVICES OFFERED

Gas engineer who has had 3½ years' experience in general operating department of public utility. Past 18 months assistant to superintendent of manufacture, in the production of coal and water gas. Graduate E. E. Age 26. Single. **874.**

Gas engineer technical graduate. Fourteen years' experience in water gas production, distribution, engineering and construction. Design, installation and operation of medium and low pressure distribution systems and high pressure transmission lines. Experienced in heavy oil operation and can produce low production costs. **875.**

Sales representative eighteen years' experience, eight selling, desires position to specialize in the sale of automatic gas water heaters, gas refrigeration, or hotel equipment, gas company or manufacturer; have own car. Married (38). **876.**

Gas engineer, technical graduate, N. Y. State Engr. License, post-graduate work in utility economics and accounting. Six years broad practical experience covering manufacture of oven, retort, and water gas—utilization—construction—customer's service—and high and low pressure distribution. Desire an executive position with small company. Will go anywhere. Married. (28). **877.**

Industrial gas sales engineer, six years' experience, large Eastern combination company, sales, installation and service of varied industrial applications, bake ovens, boilers, furnaces, etc. Familiar with all competitive fuels, preparation of estimates, cost surveys, and economical rate determinations. University graduate, 34, married. **878.**

Experienced and proven **sales manager** and salesman, who has successfully established steady, volume sales to Eastern and mid-western gas companies, wants to act as distributor in these territories for one or two quality lines of reliable manufacturers. Particularly for appliances, engineering specialties or gas distribution materials. **879.**

Experienced man, thorough knowledge installation and operation of **Property Accounting** methods constituting perpetual inventory. Familiar with requirements Uniform System of Accounts re fixed capital in utility property in New York, well versed in special reports, exhibits and statistical compilation for rate making. **880.**

Sales engineer (36) married; two years erection and sales for large manufacturer industrial furnaces; four years supervisor of industrial, commercial and house heating for large eastern utility company and four years with world's largest air conditioning manufacturer, invites correspondence and investigation of gas company officials desirous of obtaining new business. **881.**

Manufacturer's distributor, gas ranges and appliances, New Jersey, New York and Pennsylvania; wide experience in sales among utilities, leading department stores, stove jobbers, plumbers, and builders. **882.**

Manager, superintendent or **engineer** with unusually varied experience in operating and management covering coal, water and oil gas. Reforming of natural gas. Mixed and straight natural gas distribution changeover. Aggressive. **883.**

Gas service engineer experienced on construction, steel or cast-iron pipe, distribution systems or transmission line, regulator and meter stations. Also domestic and industrial appliance installations. Natural or manufactured gas. **884.**

Salesman, stoves, furnaces, boilers and radiation. Over twenty-five years' experience, all general office details, credits, collections, sales promotion, sales customers claims and traffic. Wide acquaintance among furniture, hardware and department store trade in Northern Ohio and Michigan; also specialist in warm air heating. **885.**

Man (47) with wide experience as a public utility **manager,** gas, electric, water and sewer, desires job as manager of fair-sized company or group of smaller companies. Engineering, supervising and managing since 1910. **886.**

SERVICES OFFERED

Gas engineer (39). Recently manager of small company. Experienced water gas and coke oven operator. Fifteen years' experience in natural gas measurement, distribution and industrial uses, in public relations, rate structures and promotion and sale of all types of gas appliances. **887.**

Manager for medium sized gas property, familiar with manufacture of coal and water gas. Experience with natural gas distribution and utilization. Excellent record as merchandiser. Salary secondary. **888.**

Technically trained **engineer** with adequate experience in operation, valuation, expert testimony, trade relations, customer relations, employee information, technical and statistical studies, and house organ publication. Gas and electric experience under most thorough state regulation. **889.**

Appliance sales, sales promotion and new business **manager** with utility or live dealer organization. Understand gas and electric ranges, water heaters and small appliances. Know how to supervise cooking schools, location, Southern States preferred. **890.**

Accountant-Statistician. Twelve years' broad experience with large gas company in costs, analysis, statistics, rate case preparation, office organization, financial statements, branch office audits, accounting forms, and procedures. University trained. **891.**

Manager-engineer; thirty years' experience design and construction of plants, distribution systems and transmission lines. Organization, operation, management, sales, engineering, valuations, coal water and natural gas, also electricity. Recent experience with heavy oil for water gas and high b.t.u. gas to supplement natural gas. **892.**

District regulator repairman, expert on all makes. Seven years in present position, wish to make a change, will go anywhere, married. **893.**

Gas Engineer, experienced in manufacture, application of gas meters, all types, controls and regulation; gas plant operation and maintenance experience; also, utility management training with nationally known engineering firm. Desires position as asst. engineer or asst. superintendent of measurement, distribution—married (30). Free to locate. Natural Gas preferred. **894.**

POSITIONS OPEN

Gas Appliance **Salesman** wanted. Progressive, established manufacturer of radiant and circulating heaters wants experienced representatives for Texas. One having both dealer and utility experience preferred. Commission basis, with possibility of drawing account. State age, experience, full qualifications. Unusual opportunity. **0270.**

New business manager, for gas department of eastern combination gas and electric company. An essential requirement, in addition to successfully handling domestic appliance sales, is ability to promote expansion in industrial utilization. Must be accustomed to handling personnel and meeting the public. Give full details of qualifications and experience; successful record in meeting oil competition helpful. **0274.**

CONTINUED USE OF CONFIDENTIAL CLASSIFICATION RECORDS

From the South, June 20: " . . . . thank you for your assistance. We have gone over these very carefully and we are writing to the following . . . . "

From the East, June 21: " . . . . thank you for loaning us these records, we have communicated with several of the men and appointments have been made . . . ."

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AMERICAN GAS ASSOCIATION, Inc.

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